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ANNOUNCEMENT OF THE COLLEGE OF ARTS AND SCIENCES 1917-18

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STUDY CARDS

must be filed at the office of the Dean, 143 Goldwin Smith Hall, not later than 5 p. m. on the following days:

For first term, 1917-18.

Sophomores, juniors, and seniors, Tuesday, May 30, 1917.

Freshmen and other new students, Saturday, September 29, 1917.

For second term, 1917-18.

All students, Wednesday, January 13, 1918.

Underclassmen, candidates for the degree of Bachelor of Arts, in filling out their study cards should conform to paragraphs nine and ten, upperclassmen to paragraph eleven, of the requirements for that degree, printed on pages ix-xii; and freshmen should observe the list of courses open to them as there printed.

Candidates for the degree of Bachelor of Chemistry in filling out their study cards should conform to the outline of the course as printed on pages ix, x. Before submitting their study cards to the Dean, they should secure the endorsement of the Department of Chemistry.

No student in the College will be recognized by any department as a member of any of its classes until his registration has been made at the Dean's office.

CALENDAR

First Term 1917-18

Sept. 14.	Friday.	Entrance examinations begin.
Sept. 24.	Monday.	Academic year begins. Registration of new students. Scholarship examinations begin.
Sept. 25.	Tuesday.	Registration of new students.
Sept. 26.	Wednesday	Registration of old students.
Sept. 27.	Thursday.	Instruction begins. President's annual address to the students.
Sept. 29.	Saturday	Registration, Graduate School.
Oct. 16.	Tuesday.	Last day for payment of tuition.
Nov.	Thursday.	Thanksgiving recess.
Dec. 19.	Wednesday.	Instruction ends
Jan. 3.	Thursday.	Instruction resumed } Christmas Recess.
Jan. 11.	Friday.	Founder's Day.
Jan. 26.	Saturday.	Instruction ends.
Jan. 28.	Monday.	Term examinations begin.

Second Term 1917-18

Feb. 9.	Saturday.	Registration, undergraduates.
Feb. 11.	Monday.	Registration, Graduate School.
Feb. 11.	Monday.	Instruction begins.
Mar. 1.	Friday.	Last day for payment of tuition.
April 3.	Wednesday.	Instruction ends
April 11.	Thursday.	Instruction resumed } Spring Recess.
May 25.	Saturday.	Navy Day.
June 5.	Wednesday.	Term examinations begin.
June 19.	Wednesday.	Commencement.

COLLEGE OF ARTS AND SCIENCES

FACULTY

- Charles Mellen Tyler, A.B., A.M., D.D., Professor of the History and Philosophy of Religion, and of Christian Ethics, Emeritus.
- Simon Henry Gage, B.S., Professor of Histology and Embryology, Emeritus.
- Thomas Frederick Crane, A.B., A.M., Ph.D., Litt.D., Professor of the Romance Languages and Literatures, Emeritus.
- Burt Green Wilder, B.S., M.D., Professor of Neurology and Vertebrate Zoology, Emeritus.
- Waterman Thomas Hewett, A.B., Ph.D., Professor of the German Language and Literature, Emeritus.
- Henry Shaler Williams, Ph.B., Ph.D., Professor of Geology, Emeritus.
- John Henry Comstock, B.S., Professor of Entomology and General Invertebrate Zoology, Emeritus.
- Charles De Garmo, Ph.D., Professor of the Science and Art of Education, Emeritus.
- George Sylvanus Moler, A.B., B.M.E., Professor of Physics, Emeritus.
- Jacob Gould Schurman, A.M., D.Sc., LL.D., President of the University, and Lecturer on International Law and Diplomacy.
- Frank Thilly, A.B., Ph.D., LL.D., Dean of the College, and Professor of Philosophy.
- Edward Leamington Nichols, B.S., Ph.D., LL.D., Professor of Physics.
- George Lincoln Burr, A.B., LL.D., Litt.D., Professor of Medieval History.
- Charles Edwin Bennett, A.B., Litt.D., Goldwin Smith Professor of Latin.
- James Edwin Creighton, A.B., Ph.D., LL.D., Sage Professor of Logic and Metaphysics, and Dean of the Graduate School.
- Edward Bradford Titchener, A.B., A.M., Ph.D., LL.D., Litt.D., Lecturer in Psychology and Head of the Department.
- George Francis Atkinson, Ph.B., Professor of Botany.
- Nathaniel Schmidt, A.M., Professor of Semitic Languages and Literatures.
- George Prentice Bristol, A.B., A.M., Professor of Greek and Head of the Department, Director of the Summer Session.
- Walter Francis Willcox, A.B., LL.B., A.M., Ph.D., LL.D., Professor of Economics and Statistics.
- Louis Monroe Dennis, Ph.B., B.S., Professor of Inorganic Chemistry, and Head of the Department of Chemistry.
- Joseph Ellis Trevor, Ph.D., Professor of Thermodynamics.
- Charles Henry Hull, Ph.B., Ph.D., Goldwin Smith Professor of American History.
- William Ridgely Orndorff, A.B., Ph.D., Professor of Organic and Physiological Chemistry.
- Wilder Dwight Bancroft, A.B., Ph.D., Professor of Physical Chemistry.
- Ernest George Merritt, M.E., Professor of Physics.
- Charles Van Patten Young, A.B., Professor of Physical Culture.
- Abram Tucker Kerr, B.S., M.D., Professor of Anatomy and Secretary of the Ithaca Division of the Medical College.
- James McMahon, A.M., Professor of Mathematics.
- John Henry Tanner, Ph.D., Professor of Mathematics.
- Frederick Bedell, A.B., Ph.D., Professor of Applied Electricity.
- Willard Winfield Rowlee, B.L., D.Sc., Professor of Botany.
- Heinrich Ries, Ph.B., A.M., Ph.D., Professor of Geology and Head of the Department.
- William Alexander Hammond, B.A., A.M., Ph.D., Sage Professor of Ancient Philosophy and of Aesthetics.
- Hollis Ellsworth Dann, Mus.D., Professor of Music.
- Ernest Albee, A.B., Ph.D., Professor of Philosophy.
- Benjamin Freeman Kingsbury, A.B., M.S., Ph.D., M.D., Professor of Histology and Embryology.

- Sutherland Simpson, D.Sc., M.D., F.R.S.E., Professor of Physiology.
 Martin Wright Sampson, B.A., M.A., Goldwin Smith Professor of English Literature and Head of the Department.
 William Strunk, Jr., A.B., Ph.D., Professor of English.
 Henry Augustus Sill, A.B., A.M., Ph.D., Professor of Ancient History.
 Herbert Charles Elmer, A.B., Ph.D., Professor of Latin.
 Charles Love Durham, M.A., Ph.D., Professor of Latin.
 Gilbert Dennison Harris, Ph.B., Professor of Paleontology and Stratigraphic Geology.
 George Walter Cavanaugh, B.S., Professor of Chemistry in Its Relations to Agriculture.
 John Sandford Shearer, Ph.D., Professor of Physics.
 John Irwin Hutchinson, A.B., Ph.D., Professor of Mathematics.
 Virgil Snyder, B.S., A.M., Ph.D., Professor of Mathematics.
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 Emile Monnin Chamot, B.S., Ph.D., Professor of Sanitary Chemistry and Toxicology.
 Arthur Wesley Browne, B.S., M.S., Ph.D., Professor of Inorganic and Analytical Chemistry.
 Adam Capen Gill, A.B., Ph.D., Professor of Mineralogy and Petrography.
 Julian Pleasant Bretz, A.B., Ph.D., Professor of American History.
 James George Needham, B.S., M.S., Ph.D., Professor of Entomology and Limnology.
 William Albert Riley, A.B., Ph.D., Professor of Insect Morphology and Parasitology.
 Glenn Washington Herrick, B.S.A., Professor of Economic Entomology.
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 Ernest Blaker, B.S., Ph.D., Assistant Professor of Physics.
 Othon Goepp Guerlac, Licencié ès Lettres, Licencié en Droit, M.A., LL.B., Assistant Professor of the Romance Languages and Literatures. (Absent.)
 Hugh Daniel Reed, B.S., Ph.D., Assistant Professor of Neurology and Vertebrate Zoology.
 Hermann Christian Davidsen, Ph.D., Assistant Professor of German.
 Joseph Quincy Adams, Jr., A.B., A.M., Ph.D., Assistant Professor of English.
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 Walter Buckingham Carver, Ph.B., Ph.D., Assistant Professor of Mathematics.
 Arthur Ranum, A.B., Ph.D., Assistant Professor of Mathematics.

FACULTY



Horace Leonard Jones, A.B., A.M., Ph.D., Assistant Professor of Greek.
Eugene Plumb Andrews, A.B., Assistant Professor of Archæology.
Floyd Karker Richtmyer, A.B., Ph.D., Assistant Professor of Physics.
David Clinton Gillespie, A.B., M.A., Ph.D., Assistant Professor of Mathematics.
James Chester Bradley, A.B., M.S., Ph.D., Assistant Professor of Systematic Entomology.
Oscar Diedrich von Engeln, A.B., Ph.D., Assistant Professor of Physical Geography.
Benton Sullivan Monroe, A.B., A.M., Ph.D., Assistant Professor of English.
Rasmus S. Saby, Ph.D., Assistant Professor of Political Science.
Roswell Clifton Gibbs, A.B., A.M., Ph.D., Assistant Professor of Physics.
Harry Porter Weld, Ph.B., Ph.D., Assistant Professor of Psychology.
Gustav Ernst Frederick Lundell, A.B., Ph.D., Assistant Professor of Chemistry.
Guy Brooks Muchmore, A.B., Assistant Professor of Public Speaking.
Lawrence Pumpelly, A.B., Ph.D., Assistant Professor of the Romance Languages and Literatures.
Ralph Hayward Keniston, A.B., A.M., Ph.D., Assistant Professor of the Romance Languages and Literatures.
Abbott Payson Usher, A.B., A.M., Ph.D., Assistant Professor of Economics.
Ross Peter Anderson, A.B., Ph.D., Assistant Professor of Chemistry.
Donald English, B.S., M.B.A., Assistant Professor of Economics.
Wallie Abraham Hurwitz, Ph.D., Assistant Professor of Mathematics.
James Batcheller Sumner, Ph.D., Assistant Professor of Biochemistry in the Department of Physiology.
Thomas Roland Briggs, Ph.D., Assistant Professor of Physical Chemistry and Electro-Chemistry.
Albert Hazen Wright, A.B., A.M., Ph.D., Assistant Professor of Zoology.
Arthur Augustus Allen, A.B., A.M., Ph.D., Assistant Professor of Ornithology.
William Silliman Foster, A.B., Ph.D., Assistant Professor of Education.
Elmer James Bailey, Ph.B., Ph.M., A.M., Ph.D., Assistant Professor of English.
Leslie Nathan Broughton, A.B., A.M., Ph.D., Assistant Professor of English.
Harold Lyle Reed, A.B., Ph.D., Assistant Professor of Economics.
Alexander M. Drummond, A.B., A.M., Assistant Professor of Public Speaking.
Ransom Evarts Somers, A.B., A.M., Ph.D., Assistant Professor of Geology.
Peter Andrew van der Meulen, B.Chem., Ph.D., Acting Assistant Professor of Mineralogy and Petrography.
James T. Quarles, Assistant Professor of Music.
Clyde Furman Craig, A.B., Ph.D., Assistant Professor of Mathematics.
Frederick William Owens, Ph.D., Assistant Professor of Mathematics.
Wesley Daniel Zinnecker, Ph.B., Instructor in German.
Albert LeRoy Andrews, A.B., A.M., Ph.D., Instructor in German.
Thomas Whitney Benson Welsh, A.B., Ph.D., Instructor in Chemistry.
Joseph Vance McKelvey, B.A., A.B., A.M., Ph.D., Instructor in Mathematics.
Louis Lazarus Silverman, A.B., A.M., Ph.D., Instructor in Mathematics.
Frederick Miller Smith, A.B., Instructor in English.
Charles Clarence Bidwell, A.B., Ph.D., Instructor in Physics.
Edwin Garrigues Boring, M.E., M.A., Ph.D., Instructor in Psychology.
Allan H. Gilbert, A.B., Ph.D., Instructor in English.
Frank E. E. Germann, A.B., Dr. ès Sc., Instructor in Physics.
Ralph Chapman Rodgers, M.E., A.M., Instructor in Physics.
Dane L. Baldwin, A.B., M.A., Instructor in English.
Ellsworth David Elston, A.B., Instructor in Geology.
Thomas Benjamin Brown, A.B., Instructor in Physics.
Robert Waldo King, A.B., Instructor in Physics.
Samuel Arthur Mahood, B.Sc., M.A., Instructor in Chemistry.
Hugh McMillan Kingery, B.A., M.A., Instructor in Histology and Embryology.
William Garfield Mallory, A.B., A.M., Instructor in Physics.
Ralph A. Brown, M.E., Instructor in Physics.
John William Hebel, A.B., M.A., Instructor in English.

Lewis Henry Boulter, A.B., A.M., Instructor in English.
 Carleton Chase Murdock, B.S., Instructor in Physics.
 Henry Kennedy Davis, A.B., Instructor in Anatomy.
 Charles Roland Hugins, A.B., Instructor in Economics.
 Howard A. Pidgeon, B.S., M.S., Instructor in Physics.
 Paul Thorne Weeks, A.B., Instructor in Physics.
 Murray Wright Bundy, A.B., A.M., Instructor in English.
 Henry A. Lappin, A.B., Instructor in English.
 Clarence Cameron Kochenderfer, A.B., A.M., Instructor in Economics.
 Cony Sturgis, A.B., Instructor in the Romance Languages.
 Hermann Betz, Instructor in Mathematics.
 Meyer G. Gaba, S.B., S.M., Ph.D., Instructor in Mathematics.
 Frederick Raymond Georgia, B.Chem., Instructor in Chemistry.
 John Christopher Schelleng, A.B., Instructor in Physics.
 Jesse Franklin Bradley, A.B., Instructor in English.
 Charles Antoninus Carroll, A.B., Instructor in English.
 Tudor Seymour Long, A.B., Instructor in English.
 Kemp Malone, A.B., Instructor in German.
 Ernest Trowbridge Paine, A.M., Instructor in Philosophy.
 Karl M. Dallenbach, A.B., A.M., Ph.D., Instructor in Psychology.
 Frank Hyneman Knight, Ph.B., B.S., M.A., Ph.D., Instructor in Economics.
 Antonio S. Coma, Instructor in the Romance Languages and Literatures.
 Ward C. Bean, Instructor in Geology.
 Ray Edwin Gilman, A.B., Ph.D., Instructor in Mathematics.
 Earle Hesse Kennard, B.A., Ph.D., Instructor in Physics.
 Albert Ray Shadle, B.A., M.A., Instructor in Zoology.
 Frederic Ebell Fiske, A.B., Instructor in English.
 Homer W. Smith, Instructor in Public Speaking.
 Holbrook Working, A.B., Instructor in Economics.
 Frank Colucci, Instructor in the Romance Languages and Literatures.
 Cyril Walter Greenland, B.Sc., Instructor in Geology.
 Roland Hurdon Hill, A.B., Instructor in Biochemistry.
 Arthur James Putnam, A.B., Instructor in Romance Languages.
 James Russell Jenness, S.B., Instructor in Physics.
 Leon John Sivian, A.B., Instructor in Physics.
 Miguel Zapata, Instructor in the Romance Languages.
 Halldor Hermannsson, Lecturer in Scandinavian.
 Robert Argyll Campbell, A.B., Lecturer in Economics.
 Carlotta Joaquina Maury, Ph.B., Ph.D., Lecturer in Geology.
 Edith H. Matzke, M.D., Lecturer on Hygiene.

ASSISTANTS

Andrew Curtis White, A.B., Ph.D., Reader in Greek.
 Pearl Gertrude Sheldon, A.B., Ph.D., Assistant in Geology.
 Axel Adolf Olsson, A.B., Assistant in Paleontology and Stratigraphic Geology.
 Archibald Mortimer Erskine, B.Chem., Assistant in Chemistry.
 Homer Guy Bishop, B.S., M.S., A.M., Assistant in Psychology.
 Mildred Severance, A.B., Assistant in Physics.
 Carl John Engelder, A.B., B.Chem., Assistant in Chemistry.
 Howard Irving Cole, B.Chem., Assistant in Chemistry.
 J. Allington Bridgman, B.Chem., Assistant in Chemistry.
 Charles Ethan Allen, A.B., Assistant in Histology and Embryology.
 William Malcolm Stobbs, A.B., Assistant in Anatomy.
 Julia Moesel, A.B., Assistant in Zoology.
 Joseph Peter Koller, B.Chem., Assistant in Chemistry.
 Daniel Chauncey McCoy, Assistant in Chemistry.
 John Graham Thompson, B.Chem., Assistant in Chemistry.
 Harvey Elmer Stork, A.B., Assistant in Botany.
 John Edward Sutton, Jr., A.B., Assistant in Anatomy.

Raleigh Gilchrist, A.B., Assistant in Chemistry.
Asa McKinney, Assistant in Chemistry.
Wilbur Fiske Chapman, A.B., Assistant in Political Science.
George Sylvester Morath, B.S., Assistant in Physics.
George Martin Pearsall, M.E., Assistant in Physics.
William Howard Maguire, A.B., Assistant in English History.
Allen Job Thomas, A.B., LL.B., Ph.D., Assistant in Philosophy.
Robert Squier Gutsell, Student Assistant in Histology and Embryology.
Mark Wilder Bray, A.B., M.S., Assistant in Chemistry.
William Augustus Adamson, B.A., Assistant in Chemistry.
Hugh MacKenzie, A.B., Reading Assistant in English History.
Austin Bailey, A.B., Assistant in Physics.
Stuart Deming Jackson, Assistant in Chemistry.
Ernest Edward Smith, Assistant in Physics.
Leo Paul Larkin, Assistant in Physics.
Reid Lage McClung, A.B., Assistant in Economics.
William Dudley Smith, A.B., Assistant in English History.
Earl Albert Louder, B.S., Assistant in Chemistry.
Arthur Leo Stern, Assistant in Chemistry.
Ralph D. Garwood, Ph.D., Assistant in American History.
Herman Warshaw, A.B., Assistant in Economics.
Raymond Joseph Wolf, Reading Assistant in Economics.
Merton Jerome Hubert, A.B., A.M., Assistant in the Romance Languages and Literatures.
Clayton Joseph Buttery, A.B., A.M., Assistant in the Romance Languages and Literatures.
Samuel John Leonard, Assistant in Astronomy.
Vining Campbell Dunlap, A.B., Assistant in Botany.
Livingston Pierson Teas, B.S., Assistant in Geology.
Ernest Rice Smith, A.B., Assistant in Geology.
Archie B. Hoel, Assistant in Chemistry.
Arthur John Rider, B.S., M.S., Assistant in Chemistry.
Earl Ray Sikes, A.B., Assistant in Economics.
Marion Delia Crane Carroll, A.B., A.M., Ph.D., Assistant in Philosophy.
Allan Lewis Kaufmann, Assistant in Modern European History.
Emery E. Olson, Assistant in Public Speaking.
Edwin George Flemming, LL.B., A.B., Assistant in Public Speaking.
Dean Gamble, Assistant in Zoology.
Forrest Lee Dimmick, A.B., Assistant in Psychology.
Herbert Giles Tanner, B.S., M.S., Assistant in Chemistry.
John E. Foglesong, Assistant in Chemistry.
Gordon Ellwood Wightman, Assistant in Chemistry.
Hollis Hanford Dann, Assistant in Chemistry.
Albert Lewis Culbertson, Assistant in Chemistry.
Louis Julius Waldbauer, Assistant in Chemistry.
Cuthbert Norman Clark, B.A., Assistant in Education.
Guy Everett Grantham, A.B., Assistant in Physics.
John S. Latta, B.S., Assistant in Histology and Embryology.
Gertrude Amelia Johnson, B.S., M.S., Assistant in Histology and Embryology.
Gaylord Kell Cooke, Student Assistant in Histology and Embryology.
Aaron Bodansky, B.S., Assistant in Biochemistry.
Joseph Alma Dye, A.B., Assistant in Physiology.
Stanley Ross Burlage, Assistant in Physiology.
Lewis Richard Koller, A.B., Assistant in Physics.
Irwin Likely Moore, Assistant in Physics.
Paul Frederick Stricker, Assistant in Chemistry.
Morris Herman Paskow, Assistant in Chemistry.
John Hanson Michener, A.B., Assistant in Chemistry.
Herbert August Wichelns, A.B., Assistant in Public Speaking.
Sidney Preswick Howell, Assistant in Medieval History.

Rudolph William Sandburg, Reading Assistant in Economics.
Edward Philip Theodore Tyndall, B.A., Assistant in Physics.
Richard Thomas Summers, Assistant in Chemistry.
Ralph Lewis Emmons, A.B., Reading Assistant in Economics.
Joseph Munroe Jaffin, Assistant in Chemistry.
Ralph Emerson Bitner, B.S., M.S., Assistant in Physics.
Anthony Joseph Brown, Student Assistant in Physiology.
Louis Benjamin Hoisington, A.B., Assistant in Psychology.
Archibald Warren Marshall, Assistant in Physical Geography.
Jacob Gould Schurman, Jr., Assistant in Ancient History.
William Theodore Diefenbach, B.Chem., Assistant in Chemistry.
Creig Simmons Hoyt, B.S., Assistant in Chemistry.
Rexford Wilber Jewett, Assistant in Chemistry.
Wellington Frederick Butler, Assistant in Chemistry.

COLLEGE OF ARTS AND SCIENCES

Regarding admission to the College of Arts and Sciences the General Circular of Information should be consulted.

Two courses are offered in the College of Arts and Sciences, one leading to the degree of Bachelor of Arts, the other leading to the degree of Bachelor of Chemistry.

THE DEGREE OF BACHELOR OF ARTS

1. Requirements for Graduation.

- a. Residence for eight terms as defined and provided for in paragraphs 2-4.
- b. Credit for one hundred and twenty hours, of which at least ninety hours must be for courses given in the College of Arts and Sciences.
- c. A grade of at least C in at least one-half of the work of the student. A, B, C, D are passing grades; E represents a condition; F a failure.
- d. Election of courses must be in accordance with the provisions of paragraphs 8-17 (Choice of Studies).
- e. Completion of the work in Military Drill or in Physical Training prescribed by the University Faculty.

2. Credit for Terms of Residence.

- a. **During the Academic Year.** To secure credit for a term of residence, a student must complete during that term at least twelve hours of work.

(i) If, as a result of ill health or of other causes beyond his control, a student fails to pass twelve hours in a term, the term's residence may be completed either by attendance at a summer session or by examination or by both as the Committee on Academic Records may determine, but no credit for courses elected in any other term may be used to complete the necessary twelve hours.

(ii) When the failure to pass twelve hours is due to other causes than those just specified, all credit for the term in residence and in hours is cancelled and the student may resume his work in the College only under such conditions and at such time as the Faculty may designate. A freshman, however, who, at the end of his first term, has failed to pass twelve hours of work, but who nevertheless is permitted to continue in the College, may be allowed until the beginning of his fourth term to make up deficiencies in courses for which he was registered during the first term whenever such deficiencies may, under the rules of the College, be made up.

- b. **By Examination at Admission.** In case a student has gained twelve hours of college credit by passing at admission examinations set for that purpose, he will be considered as having completed one term of residence. If the college credit gained at entrance amounts to

six hours, he may complete a term of residence by securing credit for at least six hours in a summer session of the University.

- c. **Summer Sessions.** A student who has satisfied the entrance requirements of the College and has afterward completed in two or more summer sessions of the University at least twelve hours of work in courses selected with the approval of the Dean, will be regarded as having thus fulfilled a term of residence. Credit for a maximum of eight hours and (except with the permission of the Committee on Academic Records) a minimum of five hours may be secured in any one summer session. Under no circumstances will work done in summer sessions be accepted as the equivalent of more than two terms. Courses pursued in summer sessions of other universities belonging to the Association of American Universities by a student regularly registered in this College may be credited toward the degree, but permission to take such courses must be secured in advance from the Dean of this College.

3. **Residence During the Last Two Terms.** The degree will not be conferred upon any student unless he has been in residence at Cornell University during the last two of the required eight terms.

4. **Admission to Advanced Standing.** A student admitted to the College of Arts and Sciences from another college of Cornell University or from any other institution of collegiate rank will receive credit toward the degree of Bachelor of Arts for the number of terms and of hours to which his records may, in the judgment of the Committee on Academic Records, entitle him. In order, however, to obtain the degree of Bachelor of Arts he must, as a candidate for that degree, have been in residence at least two terms in the College of Arts and Sciences and in that college only.

5. **Registration in Two Colleges of the University.** A student who has completed in the College of Arts and Sciences at least six terms of residence (no one of them under the provisions of paragraph 2b) and has received credit for at least ninety hours of work in the College may, with the permission of the Faculties concerned, be registered both in the College of Arts and Sciences and also in any other college of Cornell University.

6. **Registration in the College and in the Graduate School.** With the approval of a committee consisting of the Dean and two other members of the Faculty (to be appointed by the Dean), a student who has satisfied all the requirements of graduation except in respect of residence, may be permitted to register both in the College of Arts and Sciences and in the Graduate School.

7. **Removal of Conditions.** A student who has received a mark of E (a condition) in any course may, with the consent of the Dean, be permitted to remove the condition by examination or otherwise as the Department concerned may direct. A condition may not be removed later than registration day of the third succeeding term after it was incurred and not more than one attempt to remove a condition will be allowed.

A student who has received a mark of F (a failure) in any course must register again for the course if he desires to secure credit therefor.

Choice of Studies

8. **At least Twelve Hours of Work.** A student must register each term for at least twelve hours of work. For registration in a course not in the College of Arts and Sciences the permission of the college or of the professor concerned must be secured. (For limitation on range of freshman election see paragraph 16.)

9. **Under-class Advisers.** Each freshman and sophomore must confer with an under-class adviser before handing in his study card to the Dean. The function of the adviser is to consult with the student regarding his choice of studies, to confer with him during the term regarding his work, and generally to give him such friendly counsel as he may desire.

10. **Under-class Requirements.** During the freshman and the sophomore year, each student is required to include in the courses for which he registers the following: in English and history, six hours; in one or more languages other than English, six hours; in philosophy, psychology, and mathematics, six hours; and in physics, chemistry, geology, physical geography, and the biological sciences, six hours. Of these hours the student is required to take at least twelve, and advised to take more, in his freshman year. Each six hours may be entirely in one division (for example, English six hours), or partly in one and partly in another (for example, English three hours and history three hours). College credit gained under paragraph 2b may not be applied in satisfaction of any of these group requirements.

11. **Upper-class Groups and Advisers.** Each student shall choose at the beginning of his junior year one of the following groups:

- | | |
|--|---|
| 1. Ancient Languages. | 7. Physics. |
| 2. Modern Languages. | 8. Chemistry. |
| 3. English and Public Speaking. | 9. Botany. |
| 4. Philosophy, Psychology, and
Education (including Physical
Education). | 10. Zoology and Entomology. |
| 5. History and Political Science. | 11. Physiology, Histology, and Em-
bryology. |
| 6. Mathematics and Astronomy. | 12. Geology and Physical Geography. |

With the sanction of his adviser and of the Dean, a student may choose, instead of one of the upper-class groups listed above, a combination of two related groups. In the group selected he must complete during his junior and his senior year at least twenty hours of work. In choosing these twenty hours the student must obtain the advice and approval of some professor or assistant professor within the group. A senior in this College who is registered also in some other college of Cornell University is excused from ten of these twenty hours.

12. **Study Cards.** On or before the third day of instruction a student registering in the College for the first time must file at the Dean's office his study card with list of courses for the term.

13. Two weeks before the end of each term every student must file at the Dean's office his study card with list of courses for the next term.

14. **Changes in List of Courses.** With the consent of the Dean, a student may alter his list of courses in the first term during the first six days of instruction, and in the second term during the first day of instruction.

15. Thereafter no student shall have the right to withdraw from any course in which he is registered, unless he shall previously have obtained from the Dean authorization to do so on the ground of ill health or for other reasons beyond the student's control.

16. Courses Open to Freshmen without Special Permission.

The following courses in the College of Arts and Sciences are open to freshmen, except that

1. a student may not register for any of these courses for which he has not satisfied the prerequisites if any are specified (see announcement under each course),
2. a student may not register for any of these courses for which he has presented an acceptable equivalent at entrance.

Bibliography 1, 2

Biology 1

Botany 1, 2, 3, 4

Chemistry 1, 6, 7, 85

English 1, 3

Entomology 4, 5, 10

French 1, 3, 4, 4a, 5, 6

Geology 1, 2, 11, 21

German 1, 2, 3, 4, 4a, 5, 5a, 7, 8,

and (by special permission) 10

Greek 1, 2

History 1, 2, 31, 32.

Italian 1, 2

Latin A, B, 1, 2

Mathematics 1, 2, 2E, 3, 5, 6, 7, 8, 15

Music 1

Physics 2, 3, 4a, 4b, 7, 10

Physiology 3, 6

Spanish 1, 2, 3

Zoology 1, 5, 6, 12

17. **Theses.** Any senior candidate for the degree of Bachelor of Arts may, with the permission of the Dean, arrange with the Department in which he is taking his principal work to write a thesis which, if accepted, shall entitle him to not more than three hours of credit a term.

THE DEGREE OF BACHELOR OF CHEMISTRY

The requirements for the degree of Bachelor of Chemistry are residence for eight terms and the completion of the following curriculum. In addition to these requirements the work prescribed by the University in Military Drill or in Physical Training must be completed.

Students who have not presented three units of German and two units of French upon entering the course in chemistry, will be required to make up the shortages in these languages before the beginning of the senior year.

First Year

	No. of Course	First Term	Second Term
Introductory Inorganic Chemistry.....Chemistry	1	6	—
Qualitative Analysis.....Chemistry	7	6 or 0	0 or 6
Analytical Geometry, Differential Calculus, Integral Calculus.....Mathematics	7	5	5
Introductory Experimental Physics.....Physics	2	—	5
Drawing.....Sibley College	D3	3	—
English.....English	1	4	4

Second Year

	No. of Course	First Term	Second Term
Quantitative Analysis.....Chemistry	12	0 or 6	6 or 0
Organic Chemistry.....Chemistry	30	6	6
Gas Analysis.....Chemistry	19 & 20	4 or 0	0 or 4
Introductory Physical Experiments.....Physics	10	2	—
Physical Experiments.....Physics	14	—	2
Crystallography.....Geology	12	0 or 3	3 or 0
Opticochemical Methods.....Chemistry	24	—	3
Elective.....		—	3

Third Year

Introductory Physical Chemistry.....Chemistry	50	3	3
Physical Chemistry Laboratory.....Chemistry	51	3	3
Chemical Microscopy.....Chemistry	65	0 or 2	2 or 0
Quantitative Analysis, Lectures.....Chemistry	15	—	2
Advanced Quantitative Analysis.....Chemistry	14	2	2
General Physics.....Physics	9c	2	—
Physical Experiments.....Physics	14	2	—
Mechanics.....Sibley College	M5	5	—
Mechanical Laboratory.....Sibley College	X12	—	4
Elective.....			3

Students that wish to register in the junior year for a greater number of elective hours than the schedule demands may, with the approval of the Department, be permitted to defer taking some of the required courses of the junior year.

Fourth Year

Electrical Engineering Laboratory.....Sibley College	E12	4	—
Seminary.....Chemistry	95	—	1
Research.....Chemistry	96 (at least)	4	4
Electives.....at least		5	5

In choosing his elective subjects in the senior year the student is advised to select as his special field some one of the following seven divisions of chemistry: inorganic chemistry, analytical chemistry, organic chemistry, physical chemistry, chemical microscopy, sanitary chemistry, agricultural chemistry. While the greater part of the elective work should lie in the field thus chosen, the remainder may comprise courses in any division of chemistry, or such other courses as may be approved by the Department of Chemistry.

The provisions of paragraphs 2b, 2c, 3, 4, 12, 13, 14, and 15 relating to the degree of Bachelor of Arts apply in general to candidates for the degree of Bachelor of Chemistry. A candidate for the latter degree may register for nineteen hours a term. To register for more than nineteen hours in any term he must secure the approval of the Department of Chemistry.

COURSES OF INSTRUCTION

SEMITIC LANGUAGES AND LITERATURES

1. **Hebrew.** Throughout the year, credit three hours a term. Professor SCHMIDT. M T Th, 2, Goldwin Smith 127.

Grammar (Harper, Gesenius-Kautzsch). Genesis. Jeremiah xxvi-xlv at sight. Exercises in composition. Open only to juniors, seniors, and graduates.

2a. **Arabic.** Throughout the year, credit two hours a term. Professor SCHMIDT. T Th, 9, Goldwin Smith 127.

Grammar (Socin-Brockelmann). Selections from prose writers and poets. Exercises in composition. Open only to juniors, seniors, and graduates.

2b. **Advanced Arabic.** Throughout the year, credit two hours a term. Prerequisite course 2a. Professor SCHMIDT. W F, 2, Goldwin Smith 127.

Grammar (Wright-DeGoeje). A group of Meccan suras in the Qurân. Selections from the Prolegomena of Ibn Khaldun.

3. **Ethiopic.** Throughout the year, credit two hours a term. Prerequisite courses 1, 2a. Professor SCHMIDT. T Th, 3, Goldwin Smith 127.

Grammar (Dillmann-Bezold). Dillmann's Chrestomathia Aethiopica; the Book of Enoch (ed. Charles). Primarily for graduates.

4a. **Assyrian.** Throughout the year, credit two hours a term. Prerequisite courses 1, 2a. Professor SCHMIDT. T Th, 4, Goldwin Smith 127.

Grammar (Delitzsch). Selections from Meissner's Chrestomathie, Delitzsch's Lesestücke, and Rawlinson's Cuneiform Inscriptions of Western Asia. Primarily for graduates.

4b. **Aramaic.** Throughout the year, credit two hours a term. Prerequisite course 1. Professor SCHMIDT. T Th, 5, Goldwin Smith 127.

Grammar (Nestle, Nöldeke, Duval). The Gospel of Matthew in the Sinaitic Syriac, the Curetonian Fragments, the Peshita, and the Jerusalem Lectionary; inscriptions in the Corpus Inscriptionum Semiticarum, and the Elephantine Papyri.

5a. **Egyptian.** Throughout the year, credit two hours a term. Prerequisite courses 1, 2a. Professor SCHMIDT. W, 4-6, Goldwin Smith 127.

Grammar (Erman). Hieroglyphic texts. Study of squeezes in the Eisenlohr collection. Primarily for graduates.

5b. **Coptic.** Throughout the year, credit two hours a term. Prerequisite course 5a. Professor SCHMIDT. F, 4-6, Goldwin Smith 127.

Grammar (Steindorff). Selections from the Gospels and from Pistis Sophia. Primarily for graduates.

6. **Biblical Literature.** Throughout the year, credit two hours a term. Professor SCHMIDT. M W, 3, Goldwin Smith 120.

General introduction to the Bible, including deuterocanonical books and apocrypha, and special introduction to each book. Designed to give in brief compass the results of scientific inquiry concerning the origin, date, composition, and character of the Jewish and Christian Scriptures. Preparation of papers, discussion of special topics, and examinations. Open to juniors, seniors, and graduates. No knowledge is required of Semitic languages or of Greek.

7. **Semitic Seminary.** Throughout the year, credit two hours a term. Prerequisite courses 1, 4b. Professor SCHMIDT. M, 4-6, Goldwin Smith 127.

Study of the Psalms and Odes of Solomon in the Syriac, and of the Hebrew text coming from the Covenanters of Damascus.

8. **Comparative Semitic Philology.** Throughout the year, credit one hour a term. Prerequisite courses 1, 2, 4b. Professor SCHMIDT. F, 3, Goldwin Smith 127.

Study of certain morphological and syntactical peculiarities of the Aramaic dialects. Interpretation, for purposes of comparison, of texts in Mandaic,

Babylonian Talmudic, ancient and modern Syriac, Galilæan, Samaritan and Judæan Aramaic, Palmyrene, and Nabataean. For graduates only.

9a. **Oriental History.** Throughout the year, credit two hours a term. Professor SCHMIDT. T Th, 10, Goldwin Smith 256. Introduction to the history of Asia.

The history of Asia Minor, Syria, Arabia, Irak, Iran, India, China, Japan, Central Asia, and Asiatic Russia will be presented in outline. The illustrative material of the department will be used. Frequent examinations will be held. Open to juniors, seniors, and graduates.

[9b. **Oriental History.** Throughout the year, credit two hours a term. Professor SCHMIDT. Introduction to the history of Africa.] Not given in 1917-18.

GREEK

1. **Elementary Greek.** The essentials of the grammar; simple exercises in composition; selections from Xenophon's *Anabasis*, books I-VII; selections from the New Testament in Greek. Throughout the year, credit six hours a term. This course however is continuous throughout the year, and no credit will be allowed for the first term alone. Assistant Professor JONES. Daily, 8, Goldwin Smith 134.

Designed for students who wish to acquire, by extraordinary effort in one year, the ability to read Attic prose.

2. **Plato, Selections; Homer's Odyssey.** Throughout the year, credit three hours a term. Professor BRISTOL. T Th S, 10, Goldwin Smith 236.

A continuation of the work begun in course 1, which, or at least two years of high school Greek, is prerequisite.

3. **Euripides, Sophocles.** Reading of the *Alcestis* and *Oedipus the King*, with an introduction to the Greek drama. First term, credit three hours. Assistant Professor JONES. M W F, 10, Goldwin Smith 236.

4. **Greek Composition.** Throughout the year, credit one hour a term. Prerequisite course 2 or the equivalent. Assistant Professor JONES. Hour to be arranged. Goldwin Smith 236.

5. **New Testament Greek.** Throughout the year, credit two hours a term. Dr. WHITE. W F, 8, Barnes Hall Library.

First term. Gospel according to St. John. Introduction to the grammar and vocabulary of Biblical Greek. Second term. The three Epistles of John and the Revelation. Prerequisite course 1 or its equivalent.

7. **Myths of the Epic Cycle.** Second term, credit two hours. Assistant Professor JONES. T Th, 12, Goldwin Smith 134.

The entire cycle of myths relating to events before, during, and after the Trojan War will be illustrated by lantern views of extant monuments, vase-paintings, bas-reliefs, sculpture in the round, gems, and coins. Knowledge of Greek not required.

May not be taken to satisfy the underclass requirement in foreign language.

9. **Dramatic Poetry.** Selected plays of Aeschylus, Sophocles, and Euripides, beginning with the *Prometheus Bound*. Second term, credit two hours. Assistant Professor JONES. T Th, 11, Goldwin Smith 236.

10. **Lyric Poetry.** Selections from Hiller-Crusius' *Anthologia Lyrica* to illustrate the various types of personal poetry. First term, credit two hours. T Th, 11, Goldwin Smith 236. Professor BRISTOL.

[11. **Aristophanes.** The *Clouds* will be read entire, and parts of other plays. Second term, credit two hours. Assistant Professor JONES.] Not given in 1917-18.

12. **The Republic of Plato.** Throughout the year, credit three hours a term. Professor HAMMOND. Reading of the Greek text. Intended for students of Greek literature and of Greek philosophy. Hours to be arranged.

[15. **Thucydides.** First term, credit two hours. Professor BRISTOL. Reading of typical selections including most of books six and seven, with an introduction on the beginnings of Athenian prose literature, and its early representatives.] Not given in 1917-18.

20. **Greek Seminary.** Throughout the year, credit two hours a term. Professor BRISTOL. W, 2.30, and one other hour to be arranged. Library, Greek and Latin Seminary Room.

A critical and interpretative study of one book of Homer's Iliad, and the reading of most of the other books. For graduates, and, by special permission qualified seniors. The latter may take the reading only, if desired.

[21. **Introduction to the Study of Language.** First term, credit three hours. Professor BRISTOL.

Language as speech. The elements of phonetics. The analysis of sounds in English, Greek, and Latin. The life and growth of language. Changes in form and meaning. The languages of the Indo-European family. Their classification, and relations to one another, with special reference to Greek, Latin, German, and English. The origin and early history of the alphabet. Outline history of linguistic science, and of the "comparative method" in language study.] Not given in 1917-18.

[22. **Linguistic Study of the Germania of Tacitus.** Second term, credit two hours. Professor BRISTOL.

The Germania will be studied as the earliest extended account of the peoples of Teutonic stock and of their life and habits. Introductory to this and supplementing it the following topics will be taken up: linguistic evidence in the determination of questions of race and culture; linguistics and archæology; the earliest civilization of the "Indo-European" people; pre-history as evidenced by language.] Not given in 1917-18.

Courses 21 and 22 are designed for students of either ancient or modern languages who wish to know something of the general principles of the science of language and of the history of that science, and also for students of history who may be interested in questions on the border line of history and linguistics. They are open to graduates and to properly qualified seniors.

25. **Comparative Grammar of Greek, Latin, and Germanic.** First term, credit three hours. M W F, 11, Goldwin Smith 236. Professor BRISTOL.

The elements of phonetics; principles of investigation and of classification; sounds, word formation, and inflexion. For graduates and qualified seniors making a specialty of any foreign language, particularly if they intend to become teachers.

GREEK ART AND ANTIQUITIES

Courses 1, 2, 3, 4, and 4a in this department do not require any knowledge of Greek or of Latin. Courses 5 and 6 presuppose facility in reading Greek. Course 7 is primarily for those expecting to study in Athens.

A. **Greek Art.** November to March inclusive. Assistant Professor ANDREWS. Th, 5, Goldwin Smith Museum of Casts.

An introductory course of popular illustrated lectures on Greek sculpture, Greek antiquities, and Greek topography. Planned and timed especially to meet the needs of students in the technical and professional colleges, but open to all students and to the public. No university credit.

1. **History of Greek Sculpture.** Repeated in second term, credit three hours. Assistant Professor ANDREWS. First term, M W F, 9; second term, M W F, 11, Goldwin Smith Museum of Casts.

Lectures in the Museum of Casts. Intended to be supplemented by course 3, but may be taken separately. Not open to students who have had course 2.

2. **History of Greek Sculpture.** Throughout the year, credit two hours a term. Assistant Professor ANDREWS. T Th, 11, Goldwin Smith Museum of Casts. May not be entered in the second term.

Lectures in the Museum of Cas

3. **Greek Antiquities.** Repeated in second term, credit three hours. Assistant Professor ANDREWS. First term, M W F, 11; second term, M W F, 9, Goldwin Smith Museum of Casts. Not open to students who have had course 1.

Lectures on pre-Greek art and civilization, terra cottas, bronzes, gems, and vases. Illustrated by the material in the Museum of Casts and by stereopticon views. Intended to be taken with course 1, but may be taken separately.

4. **Greek Numismatics.** First term, credit two hours. Assistant Professor ANDREWS. T Th, 9, Goldwin Smith Museum of Casts.

A laboratory study of Greek coins. Preferably to follow course 3.

4a. **Greek Architecture.** Second term, credit two hours. Assistant Professor ANDREWS. T Th, 9, Goldwin Smith Museum of Casts.

Preferably to follow course 3.

5. **Pausanias.** Credit two hours. Assistant Professor ANDREWS. Hours to be arranged after consultation, Goldwin Smith 35.

A reading course in the sources of knowledge of Greek topography with special reference to Athens, supplemented by illustrated lectures and by readings from Thucydides and Herodotus.

6. **Greek Epigraphy.** Credit two hours. Assistant Professor ANDREWS. Hours to be arranged after consultation, Goldwin Smith 35.

A study of Greek alphabets and inscriptions, chiefly from the large collection of squeezes owned by the department. For graduates and qualified undergraduates.

7. **Modern Greek.** Credit two hours. Assistant Professor ANDREWS. Hours to be arranged after consultation, Goldwin Smith 35.

The literary language and the colloquial idiom. Athenian newspapers and stories in the vernacular will be read.

LATIN

A. **Elementary Latin; Caesar.** This course is intended for those who, after entering the University, have come to feel the need of Latin and wish by special effort to acquire a reading knowledge of ordinary prose in a single year. M T W Th F, 8, Goldwin Smith 124. Professor ELMER. Credit five hours a term. The course is however continuous throughout the year, and no credit will be allowed for the first term alone. May be elected for a total of five hours credit by students who have entrance credit for only one unit of Latin.

B. **Cicero, Selected Orations; Virgil, Aeneid, Books I-IV.** Throughout the year, credit three hours a term. Prerequisite course A or entrance credit for two units of Latin (first year and second year Latin). Professor ELMER. M W F, 2, or hours to be arranged, Goldwin Smith 124. May be entered in the second term by students who have entrance credit for only three units of Latin.

1. **Cicero, De Amicitia; De Senectute; Horace, Odes and Epodes; Latin Writing.** Throughout the year, credit three hours a term.

Sec. 1, M W F, 10, Goldwin Smith 120. Professor BENNETT.

Sec. 2, M W F, 11, Goldwin Smith 128. Professor DURHAM.

Sec. 3, M W F, 12, Goldwin Smith 128. Professor DURHAM.

2. **Sight Translation: Gellius, Selections; New Testament, Phædrus.** Oral translation at sight. Throughout the year, credit one hour a term.

Sec. 1, T, 12, Goldwin Smith 124. Professor ELMER.

Sec. 2, S, 10, Goldwin Smith 124. Professor ELMER.

Sec. 3, S, 11, Goldwin Smith 124. Professor ELMER.

Especially recommended as collateral work for those who are taking course 1, but open to all students. Courses 2 and 3 are given in alternate years.

[3. **Sight Translation: Selections from Petronius, Cato, Publilius Syrus, and Early Christian Hymns; Martial.]** Not given in 1917-18.

8. **Terence, Phormio and Adelphi; Catullus; Horace, Satires and Epistles; Seneca, Letters; Tacitus, Agricola.** Throughout the year, credit three hours a term. Prerequisite course 1. Professor DURHAM. T Th S, 9, Goldwin Smith 128.

9. **Sight Translation for Sophomores.** First term, credit one hour. Prerequisite course 1. Professor DURHAM. S, 12, Goldwin Smith 128.

10. **Classic Myths in English Literature.** Lectures, translations, and illustrative readings from English literature. Prerequisite preparatory Latin. Second term, credit two hours. Professor DURHAM. T Th, 12, Goldwin Smith 128.

This course is not intended as a substitute for any of the regular courses in Latin, and it may not be taken to satisfy the underclass requirement in foreign language.

[11. **Ovid, *Metamorphoses*; Selections from Cicero's Letters.** Throughout the year, credit two hours a term. Prerequisite course 1 or the equivalent.] Not given in 1917-18.

12. **Selections from the last six books of Virgil's *Aeneid*; Cicero, *De Officiis*.** Throughout the year, credit two hours a term. Prerequisite course 1 or the equivalent. Professor ELMER. T Th, 2, or hours to be arranged, Goldwin Smith 124.

Courses 11 and 12 are given in alternate years.

[16. **Selections from the Republican Literature: Plautus, the *Captives* and *Mostellaria*; Lucretius; Lectures on the History of Roman Literature.** Throughout the year, credit three hours a term. Prerequisite course 8, 11, or 12. Professor BENNETT.] Not given in 1917-18.

17. **Literature and History of the Early Empire: Suetonius, *Lives of the Caesars*; Pliny's *Letters*; Tacitus's *Annals*.** Throughout the year, credit three hours a term. Prerequisite course 8, 11, or 12. Professor BENNETT. T Th S, 9, Goldwin Smith 120.

Courses 16 and 17 are given in alternate years.

18. **Lyric Poetry, Catullus.** First term, credit two hours. Open by special permission to students who are taking course 17. Professor DURHAM. T Th, Goldwin Smith 128.

21. **Intermediate Course in Latin Writing.** Credit one hour a term. Prerequisite course 1. Professor ELMER. Th, 3, or hour to be arranged, Goldwin Smith 124. This course is continuous throughout the year, and no credit will be allowed for the first term alone.

[26. **Teachers' Training Course.** Throughout the year, credit two hours a term. Open, upon personal application to the professor, to students who have had course 8, 11, or 12, and have taken or are taking course 16 or 17. Professor BENNETT.] Not given in 1917-18.

27. **Roman Life and Art.** Throughout the year, credit two hours a term. Professor BENNETT. W F, 12, Goldwin Smith 120.

Topography and architectural remains of the city of Rome; a systematic consideration of the constitution of the Roman family, status of women, marriage, children, education, slavery, the Roman house and its furniture, food, dress, baths, games and amusements, books, trade, travel, religion, death, burial, etc. Lectures illustrated by lantern views, photographs, and material in the Museum of Casts.

[34. **Cicero, in *Verrem*, Fourth Oration of the *Actio Secunda*.** Throughout the year, credit one hour a term. Prerequisite course 8, 11, or 12, or the equivalent. Professor ELMER.

This course requires no prepared translation for the classroom work. The professor in charge will himself translate the orations with full comments on subject-matter, style, difficulties, etc. The members of the class will endeavor merely to read the original Latin as Cicero himself would have read it. Designed to develop in students the ability to understand and to appreciate the Latin without translating.] Not given in 1917-18.

[35. **Cicero's *Philippics*.** Throughout the year, credit one hour a term. Prerequisite course 8, 11, or 12, or the equivalent. Professor ELMER.] Not given in 1917-18.

45. **Latin Writing, Advanced Course.** Throughout the year. Professor ELMER. Th, 3, Goldwin Smith 124. For graduates. Undergraduates who have taken course 21 may also be admitted to this course.

47. **Vulgar Latin, Elementary Course.** Throughout the year, credit two hours a term. Professor DURHAM. Goldwin Smith 128.

Petronius, *Cena Trimalchionis*; *Silviæ vel potius Aetheriæ peregrinatio ad loca sancta*; *Epistula Alexandri ad Aristotelem*; Vulgate New Testament, ed. White.

50. **Latin Epigraphy.** Throughout the year, credit two hours a term. Professor DURHAM. T Th, 12, Goldwin Smith 128.

The interpretation of selected inscriptions. Special topics in the administrative history of the Roman Empire will be assigned for investigation. *Carmina Latina Epigraphica* (ed. Bücheler). Open to graduates and to qualified undergraduates. A reading knowledge of French and German is required.

For graduate courses in Latin, see the Announcement of the Graduate School.

GERMAN

1. **Course for Beginners: Oral Training, Grammar, Composition, Translation.** Repeated in second term, credit six hours.

First term.

Sec. 1, daily, 9, Goldwin Smith 177. Professor POPE.

Sec. 2, daily, 11, Goldwin Smith 177. Dr. ZINNECKER.

Second term.

Sec. 1, daily, 10, Goldwin Smith 177. Dr. ZINNECKER.

This course is equivalent to first year and second year German of the entrance requirements (credit two units). It may be elected for three hours credit by students who have entrance credit for only one unit of German (first year German). Zinnecker, *Deutsch für Anfänger*.

2. **Oral Training, Grammar, Composition, Translation.** First term, credit three hours. Prerequisite first year German of the entrance requirements. M W F, 12, Goldwin Smith 221. —.

Intended for students who have entrance credit for only one unit of German (first year German). This course is equivalent to second year German of the entrance requirements.

3. **Oral Training, Grammar, Composition, Translation.** Repeated in second term, credit five hours. Prerequisite course 1, or course 2, or entrance credit for two units of German (first year German and second year German).

First term.

Sec. 1, M T W Th F, 9, Goldwin Smith 221. Dr. ZINNECKER.

Sec. 2, M T W Th F, 10, Goldwin Smith 177. Dr. ANDREWS.

Sec. 3, M T W Th F, 10, Goldwin Smith 221. Mr. MALONE.

Sec. 4, M T W Th F, 11, Goldwin Smith 221. Mr. MALONE.

Second term.

Sec. 1, M T W Th F, 9, Goldwin Smith 177. Dr. ZINNECKER.

Sec. 2, M T W Th F, 10, Goldwin Smith 221. Dr. ANDREWS.

Sec. 3, M T W Th F, 11, Goldwin Smith 177. Mr. MALONE.

This course is equivalent to third year German of the entrance requirements. Wildenbruch, *Das edle Blut*; Riehl, *Burg Neideck*; Freytag, *Die Journalisten*.

4. **Elementary German Composition and Conversation.** Throughout the year, credit three hours a term. Open to those who are taking or have taken course 3.

Sec. 1, M W F, 12, Goldwin Smith 177. Dr. ZINNECKER.

Sec. 2, T Th S, 9, Goldwin Smith 183. First term, Dr. ANDREWS; second term, Professor POPE.

Textbook: Pope's *Writing and Speaking German*. Illustrative maps, charts, and pictures. Exercises conducted in German. It is advisable to combine course 4 with course 3 or 5.

4a. Elementary German Composition and Conversation. Second term, credit five hours. Mr. MALONE. M T W Th F, 10, Goldwin Smith 128.

Primarily for students completing course 3 in the first term. This course is equivalent to course 4, which see for prerequisite courses, books, etc.

5. Intermediate German Course. Throughout the year, credit three hours a term. Prerequisite course 3, or the equivalent.

Sec. 1, T Th S, 10, Goldwin Smith 190. First term, Professor FAUST; second term, Professor POPE.

Sec. 2, M W F, 9, Goldwin Smith 183. Mr. MALONE.

Sec. 3, T Th S, 12, Goldwin Smith 190. Dr. ANDREWS.

German grammar treated topically. Translation and oral exercises in German on the text. Readings in modern German prose. Course 4 may be combined with course 5, or instead of these, course 7 may be taken.

5a. Intermediate German Course. Second term, credit five hours. Prerequisite course 3, or the equivalent. Dr. ANDREWS. M T W Th F, 9, Goldwin Smith 221.

This course is equivalent to course 5, which see for prerequisite courses, books, etc. Primarily for students completing course 3 in the first term.

7. Intermediate German Course. Throughout the year, credit five hours a term. Prerequisite course 3, or the equivalent.

Sec. 1, M T W Th F, 10, Goldwin Smith 183. Assistant Professor DAVIDSEN.

Sec. 2, M T W Th F, 12, Goldwin Smith 183. Professor BOESCHE.

This course, in two terms, covers the work of courses 4 (or 4a) and 5 (or 5a). Oral practice and composition. Readings from modern German prose.

8. Scientific German. Second term, credit two hours. Prerequisite courses 1-3, or three years of German in high school. M W, 11, Goldwin Smith 183. Professor BOESCHE.

10. Advanced German Composition and Conversation. Throughout the year, credit three hours a term. Prerequisite courses 1-5, or the equivalent.

Sec. 1, M W F, 10, Goldwin Smith 190. Professor POPE.

Sec. 2, T Th S, 11, Goldwin Smith 183. Assistant Professor DAVIDSEN.

Exercises conducted in German. Theme-writing. This course is essential for the pursuit of advanced work in the department, and must be completed by students who desire to be recommended as teachers of German.

11. Schiller's Life and Works. Throughout the year, credit three hours a term. Prerequisite courses 1-5. Professor BOESCHE. T Th S, 11, Goldwin Smith 190.

12. Goethe's Life and Works. First term, credit three hours. Primarily for juniors and seniors. Prerequisite courses 1-5, or the equivalent. Professor FAUST. T Th S, 9, Goldwin Smith 190.

13. Goethe's Faust, part I and selected portions of part II. Second term, credit three hours. Primarily for juniors and seniors. Prerequisite courses 1-5, or the equivalent. Professor FAUST. T Th S, 9, Goldwin Smith 190.

[14. History of German Literature. Throughout the year, credit three hours a term. Prerequisite courses 1-5, or the equivalent. Professor FAUST.

An outline lecture course beginning, in the first term, with the Old High German period and extending to the middle of the eighteenth century; in the second term beginning with Lessing and extending to the present time. Lectures, recitations, and collateral reading.] Not given in 1917-18.

15. Contemporary German Literature. Throughout the year, credit three hours a term. Prerequisite courses 1-5, or the equivalent. Professor FAUST. M W F, 9, Goldwin Smith 190.

A study of the literature of modern Germany, including foreign influences. Lectures, recitations, and collateral reading.

16. The German Drama of the Nineteenth Century. Throughout the year, credit three hours a term. Prerequisite courses 1-5 and 10, or the equivalent.

Assistant Professor DAVIDSEN. M W F, 11, Goldwin Smith 190. Recitations, lectures in German, and collateral reading.

[17. **The Literature of the Reformation.** First term, credit three hours. Prerequisite courses 1-5 and 10, or the equivalent. Assistant Professor DAVIDSEN.

Lectures in German, illustrative readings from the works of Martin Luther, Ulrich von Hutten, Hans Sachs, Thomas Murner, and Johann Fischart; also from the Volksbücher and folk-songs of the sixteenth century.] Not given in 1917-18.

[18. **Lessing's Life and Works.** Second term, credit three hours. Prerequisite courses 1-5 and 10, or the equivalent. Assistant Professor DAVIDSEN.] Not given in 1917-18.

20. **History of the German Novel.** Second term, credit three hours. Prerequisite courses 1-5. Dr. ZINNECKER. T Th S, 12, Goldwin Smith 177.

Lectures on the development of the German novel, with discussions and collateral readings.

[24. **Lyric and Ballad Poetry.** Second term, credit three hours. Prerequisite courses 1-5. Professor POPE.

The development of German lyric poetry from the Middle High German period to the present. Especial attention will be given to a literary appreciation of modern lyrics and ballads.] Not given in 1917-18.

[25. **Wagner's Life and Works.** Second term, credit three hours. Prerequisite courses 1-5, otherwise only by special permission. Professor POPE.

Lectures on Wagner's theory of the music drama, the sources of his operas, his place in German literature, and his influence on modern culture. The texts of the principal operas will be read in class and biweekly illustrative recitals will be given throughout the term.] Not given in 1917-18.

[30. **The History of the German Element in the United States.** Professor FAUST.

The characteristics of the German immigrations of the seventeenth, eighteenth, and nineteenth centuries; the arrival, location, and activities of the immigrants. The relative importance of the German element in the building of the nation, with special reference to political, social, and educational influences.] Not given in 1917-18.

33. **Elementary Phonetics and its Application to the Study of Modern Languages.** First term, credit two hours. Assistant Professor DAVIDSEN. W F, 12, Goldwin Smith 190.

33a. **Advanced Phonetics.** Second term, credit two hours. Prerequisite course 33, or the equivalent. Mr. MALONE. T Th, 12, Goldwin Smith 178.

[34. **Principles of Word Formation.** First term, credit two hours. Assistant Professor DAVIDSEN.

Composition and derivation; creation of words; foreign and loan words; onomatopoeia; popular etymology; semantics.] Not given in 1917-18.

35. **History of the German Language.** First term, credit three hours. Mr. MALONE. T Th S, 12, Goldwin Smith 177.

37. **Elementary Middle High German.** First term, credit three hours. Prerequisite courses 1-5, 10, and at least six hours of advanced work in German literature. Professor POPE. T Th S, 10, Goldwin Smith 182.

Grammar; reading of the popular epics, Nibelungenlied and Kudrun. Paul's *Mittelhochdeutsche Grammatik*; Bachmann's *Mittelhochdeutsches Lesebuch*.

[38. **Modern Scandinavian.** Throughout the year, credit three hours a term. DR. ANDREWS. A study of Swedish grammar, with considerable reading from standard Swedish authors and some consideration of the history of the Swedish language and literature. For advanced students in languages and literatures.] Not given in 1917-18.

39. **Teachers' Course in German Composition.** Throughout the year,

credit two hours a term. Admission by permission only. Professor BOESCHE. T Th, 10, Goldwin Smith 234.

40. **Teachers' Course in Methods.** Second term, credit two hours. Prerequisite courses 1-5, 10, and eighteen hours of advanced work in German literature or philology. Professor FAUST, assisted by his colleagues of the German Department. T, 2-4, Goldwin Smith 181.

Methods of teaching modern languages; examination and criticism of textbooks available for the study of German; requirements for teachers' examinations.

42. **Gothic.** First term, credit three hours. Professor BOESCHE. M W F, 11, Goldwin Smith 183. Streitberg's *Gotisches Elementarbuch*; *Die Gotische Bibel*, hrg. von Streitberg. This course will serve as a general introduction to Germanic philology. Primarily for graduates.

[43. **Old High German.** First term, credit three hours. Prerequisite course 37. Professor BOESCHE. Primarily for graduates. Braune's *Althochdeutsche Grammatik* and *Althochdeutsches Lesebuch*.] Not given in 1917-18.

44. **Old Icelandic.** Throughout the year, credit three hours a term. Dr. ANDREWS. M W F, 12, Goldwin Smith 178. A study of the Old Norse grammar and the relation of Old Norse to the other Germanic dialects. Reading of saga-texts in the first term; Eddic poems in the second. Primarily for graduates.

[45. **The Icelandic Sagas.** Credit one hour. Mr. HERMANNSSON.

Lectures on the origin, development, characteristics, and historical value of the Icelandic Sagas.] Not given in 1917-18.

46. **Old Norse Mythology.** First term, credit one hour. Mr. HERMANNSSON. Lectures in English on the mythology and religion of the ancient Norsemen. F, 11, Goldwin Smith 256.

48. **Principles of Germanic Philology.** Second term, credit two hours. Prerequisite course 42. Dr. ANDREWS. W, 2-4, Goldwin Smith 178. A discussion of the fundamental principles of linguistic relationships within the old Germanic dialects. Lectures and illustrative problems.

49. **Seminary in German Literature.** First term, credit two hours. Professor FAUST. F, 2-4, Goldwin Smith 181.

For graduates only. Problems in German literature since 1880.

50. **Seminary in German Literature.** Second term, credit two hours. Assistant Professor DAVIDSEN. Hours to be arranged. Goldwin Smith 188. Primarily for graduates. Gottfried Keller.

51. **Seminary in German Philology.** Second term, credit two hours. Professor POPE. Hours to be arranged, Goldwin Smith 182. Primarily for graduates. Subject: Wolfram's *Parzival*.

[52. **Seminary in German Philology.** Second term, credit two hours. Professor BOESCHE. For graduates only. Subject: Monuments of Old High German poetry.] Not given in 1917-18.

ROMANCE LANGUAGES

FRENCH

Students intending to teach French should take the following courses as a minimum requirement for their purpose: 4, 5, 6, 14, 23, 55, and at least three other courses in French literature.

1. **Elementary Course.** Repeated in second term, credit six hours.

First term. Sec. 1, daily, 12, Goldwin Smith 283. Professor MASON.

Sec. 2, daily, 8, Goldwin Smith 283. ———.

Sec. 3, daily, 9, Goldwin Smith 290. Mr. BUTTERY.

Second term. Sec. 1, daily, 8, Goldwin Smith 283. Professor MASON.

Sec. 2, daily, 12, Goldwin Smith 290. ———.

This course is equivalent to first year French and second year French of the entrance requirements (credit 2 units). It may be elected for three hours credit by students who have entrance credit for only one unit of French (first year French).

3. **Grammar, Composition, Translation.** Repeated in second term, credit five hours. Prerequisite course 1, or entrance credit for two units of French (first year French and second year French).

First term. Sec. 1, M T W Th F, 9, Goldwin Smith 283. ____.
 Sec. 2, M T W Th F, 10, Goldwin Smith 277. ____.
 Sec. 3, M T W Th F, 12, Goldwin Smith 281. ____.

Second term. Sec. 1, M T W Th F, 9, Goldwin Smith 283. ____.
 Sec. 2, M T W Th F, 10, Goldwin Smith 277. ____.
 Sec. 3, M T W Th F, 12, Goldwin Smith 281. ____.

4. **Advanced Translation.** Repeated in second term, credit three hours. Prerequisite course 3, or third year French of the entrance requirements.

First term. Sec. 1, M W F, 9, Goldwin Smith 134. Professor MASON.
 Sec. 2, M W F, 11, Goldwin Smith 290. ____.
 Sec. 3, T Th S, 12, Goldwin Smith 221. Professor HAMILTON.

Second Term.

Sec. 1, T Th S, 9, Goldwin Smith 290. Mr. ____.

Sec. 2, M W F, 10, Goldwin Smith 227. Assistant Professor PUMPELLY.

Designed primarily for freshmen who have entrance credit for three units of French. It is prerequisite for all the following courses in French, except 5, which may be profitably taken in connection with it. Emphasis is laid upon the accurate translation in class of difficult texts, with the necessary grammatical explanations.

4a. **Advanced Translation.** Second term, credit three hours. Prerequisite course 4. T Th S, 10, Goldwin Smith 290. Professor HAMILTON.

This course is designed for those who wish further practice in translating difficult modern French prose.

5. **Elementary Composition.** Throughout the year, credit three hours a term. Prerequisite course 3, or third year French of the entrance requirements.

Sec. 1, T Th S, 9, Goldwin Smith 124. Assistant Professor PUMPELLY.

Sec. 2, M W F, 11, Goldwin Smith 277. Assistant Professor PUMPELLY.

This course should be taken early by all students who are specializing in French, if possible in connection with course 4. New registrations in the second term will be accepted only after consultation with the instructor in charge.

6. **History of French Literature.** Throughout the year, credit three hours a term. Prerequisite course 4. M W F, 11, Goldwin Smith 281. Professor MASON.

Lectures on French literature since the Middle Ages, with outside reading and reports. Recommended for all advanced students in French.

7. **Literature of the Seventeenth Century.** Throughout the year, credit three hours a term. Prerequisite course 6. M W F, 10, Goldwin Smith 281.

8. **Literature of the Eighteenth Century.** Throughout the year, credit three hours a term. Prerequisite course 6. Assistant Professor GUERLAC.

[9. **Literature of the Nineteenth Century.** Throughout the year, credit three hours a term. Prerequisite course 6. Professor MASON.] Not given in 1917-18.

10. **Contemporary French Literature and Thought.** Second term, credit three hours. Prerequisite course 6. Professor MASON.

14. **Advanced Composition.** Throughout the year, credit three hours a term. Prerequisite courses 4, 5. Assistant Professor PUMPELLY. T Th S, 11, Goldwin Smith 277.

Admission to this course depends upon the grade of work done in course 5; before registration, permission must be obtained from the instructor in charge.

21. **Prose of the Sixteenth Century.** Second term, credit three hours. Prerequisite course 6. Professor MASON. Hours to be arranged.

[22. **Poetry of the Sixteenth Century.** Second term, credit three hours. Prerequisite course 6. Professor MASON.] Not given in 1917-18.

23. **French Philology.** Throughout the year, credit three hours a term. Prerequisite entrance Latin. Assistant Professor PUMPELLE. M, 3-5, Th, 10, Goldwin Smith 281.

This course should be taken in the junior or senior year by all students who expect to teach French, and must be taken during the first year of graduate study, if not before, by all candidates for the Master's degree who present French as their major subject.

[24. **Medieval Literature.** Second term, credit two hours. Prerequisite course 6.] Not given in 1917-18.

26. **Old French Texts.** Throughout the year, credit two hours a term. Prerequisite course 23. ———. T, 2.30, Library, French Seminary Room.

A linguistic and literary study of selected old French texts. Primarily for graduates.

[27. **Modern French Seminary.** Throughout the year, credit two hours a term. Professor MASON.] Not given in 1917-18.

This course is intended to initiate graduate students into the methods of independent research as applied to modern literature. Primarily for graduates.

ITALIAN

1. **Elementary Course.** Throughout the year, credit three hours a term. T Th S, 9, Goldwin Smith 242. Professor HAMILTON.

Grammar, composition, translation of modern prose and poetry. This course may not be taken in the same year as Spanish 1. The course is continuous throughout the year, and no credit will be allowed for the first term alone.

2. **Italian Poetry: Dante, Leopardi, Carducci.** Throughout the year, credit three hours a term. Prerequisite course 1, or second year Italian of the entrance requirements. Professor HAMILTON. T Th S, 11, Goldwin Smith 281.

3. **Petrarch and the Renaissance.** Throughout the year, credit two hours a term. Prerequisite course 2. Professor HAMILTON. Hours to be arranged. Primarily for graduates.

[5. **Old Italian.** Throughout the year, credit two hours a term. Professor HAMILTON.] Not given in 1917-18.

SPANISH

1. **Elementary Course.** Repeated in second term, credit six hours. First term, three sections: daily 8, 9, 12; second term, two sections: daily 8, 12. Goldwin Smith 277.

2S. **Elementary Course.** For students in Engineering and Agriculture. Throughout the year, credit three hours a term. Two sections: M W F, 12; T Th S, 8. Goldwin Smith 290. Not open to students in Arts and Sciences; continuous throughout the year and no credit for first term alone.

3. **Advanced Course.** Repeated in second term, credit five hours. Prerequisite course 1 or second year entrance Spanish. First term, two sections: daily exc. S, 10, 11. Goldwin Smith 283. Second term, two sections, daily exc. S, 9, 10.

5. **Elementary Composition and Conversation.** Throughout the year, credit three hours a term. Prerequisite course 3 or third year entrance Spanish. Two sections: M W F, 10; T Th S, 10. Goldwin Smith 290. Courses 5 and 11 may profitably be taken together.

5a. **Elementary Composition and Conversation.** Second term, credit five hours. Daily exc. S, 11, Goldwin Smith 284. This course is equivalent to course 5. It is intended for students who take course 3 in the first term.

7. **Advanced Composition and Conversation.** Throughout the year, credit three hours a term. Prerequisite course 5 or 5a (formerly Romance Languages 43). First term, M W F, 9, Goldwin Smith 281. Second term, M W F, 9, Goldwin Smith 290. Free composition and correspondence.

11. Literature of the Nineteenth Century. Throughout the year, credit three hours a term. Prerequisite course 3 (formerly Romance Languages 41). Assistant Professor KENISTON. M W F, 11, Goldwin Smith 242.

Translation of modern authors, outside reading, lectures in Spanish.

12. History of Spanish America. Second term, credit three hours. Prerequisite course 3 (formerly Romance Languages 41). Mr. STURGIS. T Th S, 9, Goldwin Smith 277.

Translation, outside reading, reports, and lectures in Spanish.

[14. History of Spanish Literature. Throughout the year, credit three hours a term. Prerequisite course 11.] Not given in 1917-18.

Courses 14 and 16 are usually given in alternate years.

16. Literature of the Golden Age. Throughout the year, credit three hours a term. Prerequisite course 11 (formerly Romance Languages 42). Assistant Professor KENISTON. T Th S, 11, Goldwin Smith 290.

[21. Old Spanish. Throughout the year, credit two hours a term. Primarily for graduates.] Not given in 1917-18.

23. Seminary. Throughout the year, credit two hours a term. Assistant Professor KENISTON. Hours to be arranged.

Materials and methods of research in the field of Spanish literature. Primarily for graduates.

ROMANCE PHILOLOGY

53. Low Latin. Second term, credit two hours. Professor HAMILTON. Hours to be arranged. The development of Low Latin, and its relation to the Romance languages. Primarily for graduates.

[55. Romance Phonetics. Second term, credit three hours. Assistant Professor KENISTON.] Not given in 1917-18.

The mechanics of speech. A detailed study of the organs of speech and of the principal sounds produced by them. Attention is particularly directed to the pronunciation of the Romance languages. The course is especially designed for students who expect to teach these languages. For upperclassmen and graduates.

60. Old Provençal. First term, credit two hours. Professor HAMILTON. Hours to be arranged.

ENGLISH

Courses 1 and 3 are for freshmen; courses 20, 22, and 71 are primarily for sophomores. Prerequisites for admission to the remaining courses, for upperclassmen and graduates, are stated in the description of the courses.

1. Introductory Course. Throughout the year, credit four hours a term. Students who have not taken the course in the first term may enter in the second term in sections provided for them. Open only to underclassmen who have satisfied the entrance requirement in English. Freshmen who are candidates for the degree of Bachelor of Arts will ordinarily take course 3, and may not enroll in course 1 except with the consent of the head of the department. Assistant Professor BAILEY; Dr. GILBERT; Messrs. BALDWIN, HEBEL, BOULTER, BUNDY, LAPPIN, BRADLEY, FISKE, and LONG. Twenty-eight sections at the following hours: T Th F S, 8, 9, 10, 11, 12. Rooms to be announced.

A study of composition in connection with the reading of representative works in English literature, including four plays of Shakespeare, two modern novels, selected essays, and poems of Milton and Tennyson. Registration in the course is in charge of Assistant Professor BAILEY.

Students who elect English 1 must apply at Goldwin Smith A on Monday, Tuesday, or Wednesday of registration week for assignment to sections.

3. English Literature. Throughout the year, credit four hours a term. Students who have not taken the course in the first term may enter in the second term. Open only to freshmen who are not taking course 1. Lectures, T Th, 11,

Goldwin Smith B, Professor SAMPSON. Recitations, M W, 8, 9, 10, 11, 12, Professor STRUNK; Assistant Professors BAILEY and BROUGHTON; Messrs. SMITH and BALDWIN. Rooms to be announced.

Tennyson, Browning, Thackeray, Milton, Shakespeare, the Old Testament; practice in composition.

Students who elect English 3 must apply at Goldwin Smith 156 on Monday, Tuesday, or Wednesday of registration week for assignment to sections.

5. **Advanced Composition.** Throughout the year, credit three hours a term. Open to upperclassmen who satisfy the instructor that they are proficient in composition. Mr. SMITH. Room and hour to be announced.

Essays, short stories, and other exercises. Intended especially for students who are looking forward to writing as a profession.

8. **English Usage and Style.** Throughout the year, credit three hours a term. Prerequisite course 20 or its equivalent. The instructor's permission must be obtained before enrollment in the course. Professor STRUNK. T Th S, 10, Goldwin Smith 156.

A study of the theory of good English, with practical exercises. The general principles by which English usage is determined; matters of dispute in vocabulary and grammar; common errors; idioms and their origin; proof-reading; the larger questions of style, diction, and literary precedent.

[9. **Teachers' Course.** Second term, credit one hour. Assistant Professor BAILEY.

Lectures and conferences on the teaching of English in the secondary schools. Open to seniors and graduates who intend to teach English.] Not given in 1917-18.

10. **Play Writing.** Throughout the year, credit two hours a term. Open to seniors and graduates who show some special aptitude for the proposed work. Professor SAMPSON. T Th, 10, Goldwin Smith 167.

11. **Old English.** Throughout the year, credit three hours a term. Prerequisite course 1 or 3. Assistant Professor MONROE. M W F, 9, Goldwin Smith 162.

Old English grammar. Reading of selections from the Old English Chronicle, King Alfred, Ælfric, and other representative prose texts, and of the simpler poetry. Supplementary lectures and collateral reading on the growth of the language.

No student will be recommended for a high school teachership in English unless he has had this course or its equivalent. The course should be taken in the junior year.

12. **Middle English.** Throughout the year, credit two hours a term. Prerequisite course 11. Assistant Professor NORTHUP. T Th, 12, Goldwin Smith 167.

First term, selections from Emerson's Middle English Reader; second term, reading of the more important authors, including Chaucer and Langland, illustrative of the literature from the twelfth to the fourteenth century.

20. **Nineteenth Century Prose.** Throughout the year, credit three hours a term. Prerequisite course 1 or 3. Assistant Professors PRESCOTT, NORTHUP, MONROE, and BROUGHTON. M W F, 9, 11, 12; T Th S, 10, 12, Goldwin Smith 164.

Reading of English prose with especial reference to style; practice in composition, with conferences.

Students who elect English 20 must apply at Goldwin Smith 173 on Wednesday or Thursday of registration week for assignment to sections.

22. **Nineteenth Century Poetry.** Throughout the year, credit three hours a term. Students who have not taken the course in the first term may enter in the second term. Open to sophomores and upperclassmen. Professors SAMPSON and STRUNK; Assistant Professors PRESCOTT, ADAMS, and BAILEY. M W F, 9, Goldwin Smith 156, 160; M W F, 11, Goldwin Smith 156; T Th S, 9, Goldwin Smith 156, 162.

Wordsworth, Coleridge, Byron, Shelley, and Keats.

Students who elect English 22 must apply at Goldwin Smith 159 on Wednesday or Thursday of registration week for assignment to sections.

25. Old English Readings. Second term, credit two hours. Prerequisite first term of course 11. Assistant Professor MONROE. M W, 3, or hours to be arranged, Goldwin Smith 164.

Reading of selected Old English works, including portions of Beowulf.

[30. Chaucer's Canterbury Tales. Second term, credit three hours. Prerequisite course 11, 20, or 22. Professor STRUNK.

Preliminary survey of Chaucer's life and times; reading principally in the *Canterbury Tales*.] Not given in 1917-18.

32. History of English Literature. Throughout the year, credit two hours a term. Open to graduates, and to upperclassmen who have taken two full years of English. Assistant Professor BAILEY. T Th, 9, Goldwin Smith 164.

Lectures on the development of English literature; discussion of political, social, and religious conditions; recitations on required reading.

37. Shakespeare. Throughout the year, credit three hours a term. Open to upperclassmen only. Professor STRUNK. M W F, 10, Goldwin Smith 156.

First term, comedies and histories; second term, tragedies and romances. Either term's work may be elected separately.

38. Eighteenth Century Poetry. Throughout the year, credit two hours a term. Open to upperclassmen only. First term, Assistant Professor PRESCOTT; second term, Assistant Professor MONROE. T Th, 12, Goldwin Smith 156.

The history of English poetry during the Restoration and the eighteenth century; a study of Dryden, Pope, Thomson, Gray, Collins, Goldsmith, Cowper, and Burns; readings in the lesser English and Scotch poets; beginnings of the English romantic movement.

39. Eighteenth Century Prose. Throughout the year, credit two hours a term. Open to upperclassmen only. Assistant Professor BROUGHTON. T Th, 11, Goldwin Smith 167.

A study of important prose works by Swift, Defoe, Addison, Steele, Johnson, Goldsmith, and Burke.

41. The English Drama to 1642. Throughout the year, credit three hours a term. Open to upperclassmen only. Assistant Professor ADAMS. T Th S, 11, Goldwin Smith 156.

First term: the origin of the drama; miracles; moralities; interludes; the first regular comedies and tragedies; the predecessors of Shakespeare. Second term: the contemporaries and successors of Shakespeare.

42. Elizabethan Non-Dramatic Literature. First term, credit three hours. Open to upperclassmen only. Assistant Professor ADAMS. M W F, 12, Goldwin Smith 160.

The main authors studied are: Wyatt, Surrey, More, Ascham, Lyly, Greene, Sidney, Spenser, Daniel, Drayton, Raleigh, Bacon, Donne, and Herrick. Attention will also be given to the several types of literature: the sonnet, novel, essay, song, character, pamphlet, and the literature of travel.

43. Shakespearean Tragedy. Second term, credit three hours. Open to upperclassmen only. Assistant Professor ADAMS. M W F, 11. Room to be announced.

A detailed study of five of Shakespeare's tragedies.

47. The Principles of Poetry and Versification. First term, credit three hours. Open to upperclassmen only. Assistant Professor PRESCOTT. M W F, 10, Goldwin Smith 164.

An introduction to the study of poetry, in its content and form, with reading of typical English poems.

[48a. American Literature. First term, credit two hours. Open to seniors and graduates. Assistant Professor PRESCOTT.

American literature of the colonial and revolutionary periods; the growth of literary independence; Irving, Bryant, and Cooper.] Not given in 1917-18.

48b. **American Literature.** Second term, credit three hours. Open to seniors and graduates. Assistant Professor PRESCOTT. T Th S, 12, Goldwin Smith 160.

American prose and poetry of the nineteenth century.

[49. **Pastoral Poetry.** Throughout the year, credit two hours a term. Open to upperclassmen only. Assistant Professor BROUGHTON.

A study of the sources, origin, and development of the appreciation of rustic life and landscape in English poetry. Among the authors considered are Theocritus, Virgil, Spenser, Shakespeare, Fletcher, Jonson, Milton, Pope, Thomson, Collins, Burns, and Wordsworth.] Not given in 1917-18.

50. **Milton and Spenser.** Throughout the year, credit two hours a term. Open to upperclassmen and graduates. Dr. GILBERT. Hours to be arranged.

The chief works, lives, times, political and religious beliefs, and theories of art of both poets. Milton's minor poems, the influence of Spenser on Milton. Illustrative reading from the Bible, Homer, Virgil, Dante, Ariosto, and Tasso.

51. **Elizabethan Poetry.** Throughout the year, credit two hours a term. Open to upperclassmen only. A study of Sidney, Daniel, Drayton, and Donne in relation to the literature of their time. Mr. HEBEL.

52. **Victorian Literature.** Throughout the year, credit three hours a term. Open to upperclassmen and graduates. Assistant Professor NORTHUP. T Th S, 9, Goldwin Smith 160.

Lectures on the chief literary tendencies and characteristics of the period; studies of the leading poets and of some of the greater writers of prose. The work in this course is essentially different from that in courses 1 and 3.

56a. **The Arthurian Legends.** First term, credit three hours. Open to upperclassmen and graduates. Assistant Professor NORTHUP. M W F, 12, Goldwin Smith 167.

An introduction to the comparative study of literature; the development of the Arthurian legends as illustrative of literary origins; the treatment of the legends by modern European poets.

56b. **Middle English Literature.** Second term, credit three hours. Open to upperclassmen and graduates. Assistant Professor NORTHUP. M W F, 12, Goldwin Smith 167.

Studies in the history of Middle English literature, with special reference to the romances and their relations to continental literature.

59. **Dramatic Structure.** Throughout the year, credit three hours a term. Open to seniors and graduates. Professor SAMPSON. M W F, 12, Goldwin Smith 156.

A study of the principles of dramatic construction, based upon Greek, Elizabethan, and classical French drama (first term), and modern drama (second term). Reading of a hundred representative plays.

Supplementary work in this course, carrying two hours of credit, may be offered, T Th, 12, provided a sufficient number of those enrolled in the three-hour course notify the instructor of their wish to do the additional work.

71. **English Translations of Greek and Latin Classics.** Throughout the year, credit three hours a term. Open to sophomores and upperclassmen. Professor COOPER. T, 3, Th, 3-5, Goldwin Smith 236.

Rapid reading in the best translations, with emphasis upon Greek masterpieces; for example, the Iliad and the Odyssey, select plays of Sophocles, and select dialogues of Plato. Translations from the Latin will be chosen for the bearing of the original works upon modern literature.

72. **The Principles of Literary Criticism.** Throughout the year, credit two hours a term. Open to seniors and graduates. Professor COOPER. W, 3-5, Goldwin Smith 236.

Partly designed for those who desire to teach English. A study of the chief theories of poetry, and chief types of literature, with illustrations mainly drawn from the English poets.

73. Dante in English. Throughout the year, credit two hours a term. Open to seniors and graduates. Professor COOPER. M, 3-5, Goldwin Smith 236.

A certain amount of reading for the sake of literary and historical perspective, followed by a study in detail of selections from the Divine Comedy. Emphasis is laid upon the intermediary position of Dante with respect to English literature and the ancient classics.

74. Early English Literary Types. Throughout the year, credit three hours a term. Open to upperclassmen and graduates. Professor COOPER. M, 9, W, 9-11, or hours to be arranged, Goldwin Smith —.

A study, not primarily linguistic, of the Christ of Cynewulf and of selections in Cook's Literary Middle English Reader, illustrating types of prose and poetry other than the drama and the popular epic. Candidates must satisfy the instructor respecting their preparation for the course.

[75. Methods and Materials in the Study of English. Throughout the year, credit two hours a term. Open to graduates. Professor COOPER.

A study of important treatises on the method of scholarship, and of the relations between English and similar disciplines; an introduction to the bibliography of English. Candidates must be prepared to read French and German.] Not given in 1917-18. To be given in 1918-19.

76. Chaucer. Throughout the year, credit two hours a term. Open to graduates. Professor COOPER. Wednesday, 7.30 p. m., English Seminary Room.

A survey of books and topics that are essential to the study of Chaucer; systematic reading of his works; a detailed examination of significant passages.

80. Victorian Poetry. For graduates only. Assistant Professor BAILEY. Hours to be arranged.

81. The Tudor-Stuart Drama. For graduates only. Assistant Professor ADAMS. Hours to be arranged.

A detailed study of some one dramatist, or the investigation of some question relating to the period.

82. Pastoral Poetry. For graduates only. Assistant Professor BROUGHTON. Hours to be arranged.

83. Layamon's Brut. For graduates only. Assistant Professor MONROE. Hours to be arranged.

Textual and historical study of the poem with special reference to its connection with the Arthurian legend.

84. Elizabethan Bibliography. For graduates only. Assistant Professor ADAMS. Hours to be arranged.

A study of the books necessary to research in Elizabethan literature

86. The Epic and the Romance. For graduates only. Assistant Professor NORTHUP. Hours to be arranged.

Studies of the English heroic epic, with special reference to Germanic culture, and of the other epic poetry of the Teutonic peoples; also of the conditions under which the epics were replaced by the romances.

87. The Phonology, Inflections, and Metre of Old English. For graduates only. Professor STRUNK. Hours to be arranged.

The relation of Old English to Modern English and to German. Reading of Elene or Beowulf.

88. American Literature. For graduates only. Assistant Professor PRESCOTT. Hours to be arranged.

The literary relations of England and America. Provincial and national traits in American literature.

89. The Drama. For graduates only. Throughout the year. Professor SAMPSON. W, 2.

A study of the technique of several of the chief Elizabethan and modern dramatists.

90. **The Georgian and Victorian Drama.** For graduates only. Assistant Professor NORTHUP. Hours to be arranged.

Studies, in part comparative, of representative plays of the period 1768-1885. Investigation of special problems.

91. **The Sonnets of Shakespeare.** For graduates only. Throughout the year. Assistant Professor ADAMS. Th, 3-5. Room to be announced.

PUBLIC SPEAKING

1. **Public Speaking.** Throughout the year, credit three hours a term.

Sec. 1, T Th S, 8, Goldwin Smith 21. Mr. SMITH.

Sec. 2, M W F, 9, Goldwin Smith 24. Assistant Professor MUCHMORE and Mr. OLSON.

Sec. 3, M W F, 10, Goldwin Smith 24. Assistant Professor DRUMMOND and Mr. FLEMMING.

Sec. 4, M W F, 12, Goldwin Smith 24. Professor WINANS.

Designed to give the student the fundamentals of speech preparation and to help him acquire a simple, direct manner of speaking. Original speeches and interpretation of selections. Individual instruction will be given by appointment.

The '86 Memorial Prize in declamation is awarded annually in connection with this course. See pamphlet on prizes.

1a. **Public Speaking.** Second term, credit three hours.

Sec. 1, M W F, 8, Goldwin Smith 21. Mr. SMITH.

Sec. 2, T Th S, 10, Goldwin Smith 21. Mr. OLSON.

This course repeats the work of the first term in course 1.

6. **Public Speaking for Engineers.** Repeated in second term, credit two hours. Assistant Professor DRUMMOND and Mr. OLSON. M W, 12, Goldwin Smith 21. Also M F, 12, if the class is large.

Engineering students may take instead the more complete general course 1; or on completion of course 6 may take the second half of course 1.

8. **Voice Training.** Repeated in second term, credit one hour. Assistant Professor MUCHMORE. T Th S, 10, Goldwin Smith 26.

An elementary course for the improvement of untrained voices, and for the development of flexibility, strength, and purity of tone. The work will necessarily include exercises to give poise and freedom to the body. Recommended to all students in this department, but equally adapted to those who wish only to use their voices better in conversation. Individual instruction by appointment.

8a. **Voice Training.** Second term, credit one hour. Prerequisite course 8 and consent of instructor. Assistant Professor MUCHMORE. Hours to be arranged, Goldwin Smith 26.

Practice, and discussions of assigned readings relating to the science underlying voice training. Especially for teachers.

10. **Oral Reading.** Throughout the year, credit two hours a term. Assistant Professor MUCHMORE. W F, 11, Goldwin Smith 21.

Reading based on interpretative study of prose, poetry, and drama of assured literary value. The aim of the course is simple, intelligent, and expressive reading, and the literary appreciation necessary to such reading. Discussions will form part of the training.

12. **Argument and Debate.** Throughout the year, credit three hours a term. Assistant Professor DRUMMOND. T Th, 12, and an hour to be arranged, Goldwin Smith 21.

Study of the principles of argumentation; brief-writing, textbooks, discussions, and conferences. Principles and illustrative matter will be drawn largely from historical and stylistic study of the writings and speeches of Burke, Hamilton, and Lincoln. Constant practice in oral argument, based on written

briefs. The aim is training in analysis, the use of authorities, the weighing of evidence, and fair-minded discussion.

15. Advanced Public Speaking. Throughout the year, credit three hours a term. Prerequisite five hours in other courses of this department, including three hours of 1 or 1a, and the consent of the instructor. Professor WINANS. T Th S, 11, Goldwin Smith 21.

Speeches prepared by various methods and for various occasions will be delivered. Study of speech preparation, with special attention to interest and persuasion, and analysis of notable speeches.

[16. Principles of Speech Preparation. First term, credit two hours. Prerequisite course 1. Professor WINANS. Open to graduates and seniors.

A study based upon masterpieces of oratory considered with special reference to their occasions. Composition and delivery of speeches.] Not given in 1917-18.

20. Seminary. Throughout the year, credit two hours a term. For the study of special subjects in the history, literature, rhetoric, psychology, and pedagogy of public speech. Conducted by Professor WINANS and other members of the department. Hours to be arranged.

29. Oral Expression for Architects. First term, credit three hours. See Announcement of College of Architecture.

PHILOSOPHY

1. Problems of Philosophy. First term, credit three hours. Lectures, discussions, and prescribed reading. Lectures, Professor THILLY. M W, 11, Goldwin Smith B.

Recitations:

Sec. 1, F, 11, Goldwin Smith 225. Professor THILLY.

Sec. 2, F, 11, Goldwin Smith 227. Mr. PAINE.

Sec. 3, F, 11, Goldwin Smith B. Dr. THOMAS.

The fundamental problems of philosophy, together with a critical study of the most important solutions of them that are offered by thinkers today. The nature and scope of philosophy; its relation to the physical and mental sciences and religion; materialism; idealism; dualism; the double-aspect theory; the mechanical theory of the world; the teleological theory; the theory of evolution; the belief in God; rationalism, empiricism, and criticism; realism and idealism.

2. Logic. First term, credit three hours. Mr. PAINE. M W F, 12, Goldwin Smith 227.

This course will cover practically the same ground as course 3, which is given in the second term. More emphasis will, however, be laid upon the criticism and construction of various forms of argument both deductive and inductive.

3. Logic. Second term, credit three hours. Professor CREIGHTON. T Th S, 11, Goldwin Smith 225. Mr. PAINE. T Th S, 9, Goldwin Smith 227.

The general character of the thinking process, its laws of development, and the methods by which thought actually proceeds to solve the problems presented to it; the analysis of logical arguments and the detection of fallacies, in both the deductive and the inductive process of reasoning. Creighton's Introductory Logic will be used as a textbook.

4. The Fine Arts: their Philosophy and History in Outline. First term, credit three hours. Professor HAMMOND. T Th S, 10, Goldwin Smith 225.

An elementary course on æsthetics. Lectures, assigned readings, and examinations. An historical survey of the more important branches of art and the psychology of the appreciative feelings and the æsthetic judgment.

5. History of Philosophy. Throughout the year, credit three hours a term. Professor CREIGHTON. T Th S, 9, Goldwin Smith 225.

The history of philosophical speculation from its origin among the Greeks to the present time; the various philosophical systems in their relation to the science and general civilization of the ages to which they belong, and their application

to social, political, and educational problems; the speculative problems of the present century, and especially the philosophical meaning and importance of the notion of evolution or development. Reading will be assigned from time to time, but there will be no class textbook. Open to juniors, seniors, and graduates.

6. Moral Ideas and Practice. Second term, credit three hours. Lectures, discussions, and prescribed reading. Lectures, Professor THILLY. M W, 11, Goldwin Smith B.

Recitations:

Sec. 1, F, 11, Goldwin Smith 225. Professor THILLY.

Sec. 2, F, 11, Goldwin Smith B. Dr. THOMAS.

The development of moral ideas and practices from primitive times to the present, with an examination of the fundamental virtues and duties.

7. Ethics. First term, credit three hours. Professor THILLY. M W F, 9, Goldwin Smith 225.

Lectures and discussions. The nature and methods of ethics; theories of conscience; analysis of conscience; the ultimate ground of moral distinctions; the teleological conception; hedonism; energism; critique of hedonism; the highest good; optimism and pessimism; free will and determinism.

8. The Renaissance. Second term, credit three hours. Professor HAMMOND. T Th S, 10, Goldwin Smith 225.

Lectures and assigned readings. A philosophical study of the civilization of the Renaissance, with special reference to the fine arts, the rise of humanism, and the beginnings of modern philosophical and political theories.

9. Philosophical Ideas in Nineteenth Century Literature. First term, credit three hours. Professor ALBEE. M W F, 12, Goldwin Smith 225.

This course does not presuppose previous acquaintance with philosophy. After considering the tendencies of eighteenth century thought and the new departure represented by what is most characteristic in nineteenth century thought, both in philosophy and in literature, the course will deal with the interpretations of life offered by well known authors of the nineteenth century, both English and continental, and the relation of such interpretations to the recognized tendencies of contemporary philosophy.

10. Social and Political Ethics, and the Theory of the State. Second term, credit three hours. Professor THILLY. M W F, 9, Goldwin Smith 225.

Lectures and reading. For juniors, seniors, and graduates only.

11. Philosophical Results and Applications. Second term, credit one hour. Open to all students who have taken at least one course in philosophy. Professor CREIGHTON. Th, 12.

12. The Theory of Evolution: Its History and Significance. Throughout the year, credit one hour a term. Mr. PAINE. S, 11, Goldwin Smith 227.

Intended primarily for undergraduates. No acquaintance with the history or special terminology of philosophy is presupposed.

13. Origin and Development of Religious Ideas. First term, credit two hours. Mr. PAINE. T Th, 12, Goldwin Smith 227.

The origin of religious belief and the conditions of its development, with a brief examination of various forms of primitive religion; the history and significance of the more highly developed religions, such as Brahmanism, Buddhism, Judaism, Mohammedanism, and Christianity.

14. Psychology and Philosophy of Religion. Second term, credit two hours. Mr. PAINE. T Th, 12, Goldwin Smith 225.

Psychological analysis of some of the more important types of contemporary individual and social religious experience; relation of religion to science; the question of the place of religion in a philosophical account of the world.

16. Reading of German Philosophy. Throughout the year, credit one hour a term. Professor HAMMOND. T, 2, Goldwin Smith 220.

The primary aim of this course is to aid students in acquiring a knowledge of German philosophical terminology and facility in the translation of philosophical prose. The text for class use will be Windelband's *Platon*.

17. **Sources of Ancient and Medieval Philosophy.** Second term, credit two hours. Professor HAMMOND. M W, 11, Goldwin Smith 220.

Critical examination of the sources, lectures on historical problems, and discussions.

Primarily for graduates, and open to seniors only by special permission.

[18. **Types of Metaphysical Theory.** First term credit two hours. Prerequisite course 1 or 5 or the equivalent. Professor CREIGHTON.] Not given in 1917-18.

19. **The Development of Modern Philosophical Problems.** First term, credit three hours. Prerequisite course 5 or its equivalent. Professor CREIGHTON. T Th S, 12, Goldwin Smith 225.

20. **History of Ethics, Ancient, Medieval, and Renaissance.** First term, credit two hours. Professor HAMMOND. M W, 11, Goldwin Smith 220.

Lectures and assigned readings. A history of moral ideals and reflection in antiquity, the Middle Ages, and the Renaissance, treated in connection with social and political institutions. Primarily for seniors and graduates.

21. **History of Modern Ethics.** Second term, credit two hours. Professor ALBEE. M W, 11, Goldwin Smith 225.

The history of modern ethics with special reference to the development of the commonly recognized methods of ethics. The history of British ethics will receive particular attention as illustrating the gradual differentiation of ethics as an independent science or philosophical discipline. Primarily for graduates.

[26. **Advanced Ethics.** Throughout the year, credit three hours a term. Professor THILLY. Primarily for graduates.] Not given in 1917-18.

27. **The Republic of Plato.** Throughout the year, credit three hours a term. Professor HAMMOND. Reading of the Greek text. M W F, 10, Goldwin Smith 222.

This course is intended for students of Greek literature as well as of Greek philosophy.

28. **Aristotle's Ethics.** Throughout the year, credit three hours a term. Professor HAMMOND. M W F, 9, Goldwin Smith 222.

Reading of the Greek text. The *Nicomachean Ethics* will be read and interpreted in connection with Aristotle's theories.

29. **Modern Idealistic Theories of Ethics.** Throughout the year, credit three hours a term. Professor THILLY. M W F, 10, Goldwin Smith 220. Lectures, discussions, and essays. Primarily for graduates.

30. **Empiricism and Rationalism.** First term, credit three hours. Professor ALBEE. T Th S, 11, Goldwin Smith 220.

Lectures, discussions, and essay. The empirical movement, as represented by Locke, Berkeley, and Hume, and the rationalistic movement as represented especially by Leibniz, with reference to their distinctive methods. Primarily for graduates.

31. **The Critical Philosophy of Kant.** Second term, credit three hours. Professor ALBEE. T Th S, 11, Goldwin Smith 220.

Lectures, discussions, and essay. A study of the *Critique of Pure Reason* (Müller's translation), with frequent references to standard commentaries and to the more recent literature on the subject; the relations in which the three *Critiques* of Kant stand to each other. Primarily for graduates.

[32. **Early Rationalism: Spinoza and Leibniz.** Second term, credit two hours. Professor ALBEE.

Lectures and discussions. Primarily for graduates.] Not given in 1917-18.

33. **German Pessimism, with special reference to Schopenhauer.** Second term, credit two hours. Professor ALBEE. M W, 12, Goldwin Smith 220.

Schopenhauer's *World as Will and Idea* will be treated somewhat in detail in the lectures, the ethical and social significance of modern pessimism will be discussed, and the philosophy of Nietzsche will be examined as representing a radically different phase of voluntarism. Primarily for graduates.

[34. **Problems and Methods in Recent Philosophy.** Throughout the year, credit two hours a term. Professor ALBEE.

Lectures, reading of prescribed authors, and discussions. Primarily for graduates.] Not given in 1917-18.

[35. **Logical Theory.** Throughout the year, credit two hours a term. Professor ALBEE. Lectures, reading of prescribed authors, and discussions. Primarily for graduates.] Not given in 1917-18.

36. **The Philosophy of Bergson.** Throughout the year, credit two hours a term. Professor ALBEE. T Th, 12, Goldwin Smith 220.

Bergson's principal works will be read and discussed with a view to determining the significance of his philosophy for recent thought. Primarily for graduates.

37. **Seminary in Ethics.** Throughout the year, credit two hours a term. Professor THILLY. Hours and room to be arranged.

38. **Seminary in Ancient and Medieval Philosophy.** Throughout the year, credit two hours a term. Professor HAMMOND. W, 3-5, or hours to be arranged, Goldwin Smith 220.

The work in 1917-18 will be devoted to the reading and discussion of selected dialogues of Plato and the *Politics* of Aristotle in English translations.

40. **Seminary in Logic and Metaphysics.** T, 3-5, Goldwin Smith 231. Professor CREIGHTON, and Mr. PAINE.

The subject for 1917-18 will be in the field of Logic and will be announced at the beginning of the year.

41. **Seminary in Aesthetics.** Historical study of æsthetic theories. Throughout the year, credit two hours a term. Professor HAMMOND. Hours to be arranged.

PSYCHOLOGY

1. **Elementary Psychology.** First term, credit three hours. Professor TITCHENER, Assistant Professor WELD, Dr. DALLENBACH, Mr. BISHOP, and Mr. DIMMICK. Lectures, T Th, 11, Goldwin Smith C; class-room work, S, 10 or 11. Not open to juniors or seniors. Primarily for sophomores in the College of Arts and Sciences.

1a. **Elementary Psychology.** First term, credit three hours. Dr. BORING and Mr. HOISINGTON. Lectures, M W, 12, Goldwin Smith C; class-room work, F, 10, 11, or 12. Open to juniors and seniors.

1b. **Elementary Psychology.** Second term, credit three hours. Dr. DALLENBACH, Mr. BISHOP and Mr. HOISINGTON. Lectures, M W, 12, Goldwin Smith C; class-room work, F, 10, 11, or 12. Open to juniors and seniors.

2. **General Psychology: Problems and Points of View.** Second term, credit three hours. Prerequisite course 1, 1a, or 1b. Assistant Professor WELD. Lectures, T Th, 11, Goldwin Smith C; class-room work, S, 10, 11, or 12.

2a. **Psychology of the Abnormal Mind.** First term, credit two hours. Prerequisite course 2 or 3. Dr. BORING. T Th, 12, Goldwin Smith C.

3. **Experimental Psychology: Qualitative.** Repeated in second term, credit three hours. Prerequisite course 1, 1a, or 1b. Assistant Professor WELD, Dr. BORING, Dr. DALLENBACH, Mr. BISHOP, Mr. DIMMICK, and Mr. HOISINGTON. M W F, 2-4, Morrill, Psychological Laboratory.

4. **Experimental Psychology: Quantitative.** Repeated in second term, credit three hours. Prerequisite courses 1, 1a, or 1b, and 3. Assistant Professor WELD, Dr. BORING, Dr. DALLENBACH, Mr. BISHOP, Mr. DIMMICK, and Mr. HOISINGTON. M W F, 2-4, Morrill, Psychological Laboratory.

[5. **Systematic Psychology: Sensation, Image.** First term, credit three hours.] Not given in 1917-18.

5a. **Systematic Psychology: Perception, Idea.** First term, credit three hours. Prerequisite course 3, or by special permission course 2. Assistant Professor WELD. Lectures, M W F, 9, Morrill 46.

[6. **Systematic Psychology: Feeling, Attention, Action.** Second term, credit three hours.] Not given in 1917-18.

6a. **Systematic Psychology: Memory, Imagination and Thought; Emotion and Volition.** Second term, credit three hours. Prerequisite course 3, or by special permission course 2. Dr. BORING, Dr. DALLENBACH, and Mr. BISHOP. Lectures, M W F, 9, Morrill 46.

7. **Reading of German Psychology.** First term, credit one hour. Dr. DALLENBACH. Hour to be arranged. Morrill 46.

[8. **Reading of French Psychology.** Second term, credit one hour.] Not given in 1917-18.

9. **Psychological Problems.** Throughout the year, credit one to five hours a term. Prerequisite course 4. Assistant Professor WELD, Dr. BORING, and Dr. DALLENBACH. Morrill, Psychological Laboratory.

For particulars of graduate work see Announcement of Graduate School.

EDUCATION

Psychology 1, 1a, or 1b is prerequisite to all courses in Education.

1. **Educational Psychology.** Repeated in second term, credit three hours, First term. Assistant Professor FOSTER. Lectures and recitations. M W F, 11, Goldwin Smith 142.

Second term. Lectures: T Th, 2, Goldwin Smith 142. Professor OGDEN. Recitations: Hours and places to be arranged. Professor OGDEN and Assistant Professor FOSTER.

A study of the learning process and its application to educational theory and practice. The original nature of man; reflex action and instinct; the acquisition of habits; attention, memory, association and thinking; fatigue; individual differences; social cooperation.

2. **Principles of Education.** First term, credit three hours. Professor OGDEN. M W F, 2, Goldwin Smith 234. Prerequisite Education 1.

The nature and significance of education; biological and psychological foundations; the school as a social institution; educational ideals and values; the curriculum; administration and general methods.

3. **History of Education.** Second term, credit three hours. Assistant Professor FOSTER. M W F, 2, Goldwin Smith 234. Prerequisite Education 1.

A general historical account of the development of educational aims, contents, and methods in its relation to ethnological, psychological, and sociological factors.

5. **High School Teachers and Teaching.** Second term, credit two hours. Professor BRISTOL. T Th, 11, Goldwin Smith 124. For seniors only.

The American high school and its development in recent years. The various types of high schools. The curriculum. The teachers. Relation and duties of high school teachers to their students, to the college and to the community and state.

5. **Philosophy of Education.** Second term, credit three hours. Professor OGDEN. T Th S, 10, Goldwin Smith 248. Prerequisite Education 1, and at least one course in philosophy.

A study of education as interpreted by the more important philosophical conceptions and theories, with special application to the spirit and demands of modern society.

6. **Experimental Methods and Results in Education.** Second term, credit two hours. Assistant Professor FOSTER. W, 3-5, Goldwin Smith 248. Prerequisite Education 1.

The chief problems of experimental education; the application of psychological and statistical methods to problems of educational measurement; chief results and practical bearings.

7. **Mental Tests.** First term, credit two hours. Assistant Professor FOSTER. T Th, 2-4, Goldwin Smith 248. Prerequisite Education 1 and Psychology 3.

Laboratory practice. Logical and mathematical treatment of experimental data; single tests of sensory capacity and of the special mental functions; the graded series of tests of intelligence in children and adults; tests of information and of educational attainment.

8. **Experimental Investigation.** Repeated in second term, credit and hours to be arranged. Assistant Professor FOSTER. Goldwin Smith 251. Prerequisite Education 7.

Experimental study of a special problem in educational psychology or in mental tests.

9. **Reading of German Educational Psychology.** First term, credit two hours. Professor OGDEN. Th, 4-6, Goldwin Smith 248. Prerequisite Education 1.

The aim of the course is to aid in facility of translation and to familiarize the student with certain monographic literature.

10. **Seminary in Education.** Throughout the year, credit two hours a term. Professor OGDEN. T, 4-6, Goldwin Smith 248. Prerequisite Education 1.

Topics relevant to the fundamental assumptions of educational theory will be chosen.

HISTORY

A. **The History of Civilization.** Throughout the year, F, 12, Goldwin Smith A. Professors SCHMIDT, SILL, BURR, and others.

A course of public lectures on some of the principal epochs and characters of history, and on their significance in the progress of humanity. The lectures will be open to all students and to the public, but no university credit will be given.

1. **Greek and Roman History.** First term, credit three hours. Professor SILL. M W F, 11, Goldwin Smith A.

A general survey of the history of the Mediterranean world from the beginnings of European civilization to the time of Alexander the Great. Intended especially for freshmen. Textbook, lectures, quizzes, and collateral reading.

2. **Greek and Roman History.** Second term, credit three hours. Professor SILL. M W F, 11, Goldwin Smith A.

From Alexander the Great to Constantine. Intended especially for freshmen. Textbook, lectures, quizzes, and collateral reading.

3. **Alexander's Empire and the Hellenistic Age.** First term, credit two hours. Professor SILL. T Th, 11, Goldwin Smith 134.

Greek life and thought from the time of Alexander the Great to the Roman Conquest.

4. **Roman History.** Second term, credit two hours. Professor SILL. T Th, 11, Goldwin Smith 134.

The establishment, organization, development, and downfall of the Roman Empire.

5. **Military History.** First term, credit two hours. Once a week at an hour to be arranged. Professor SILL.

A class for the cooperative study of the principles of strategy, as exemplified in certain ancient and modern campaigns.

Those who wish to join this class should consult Professor Sill before registering.

[5a. **History of Science.** First term, credit two hours. Professor SILL. The class will meet once a week, at an hour to be arranged. While due attention will be paid to the Greek achievements in science, the work will also include a study of the revival of science and its progress in modern times.] Not given in 1917-18.

6. **History of Law.** Second term, credit three hours. Professor SILL. M W F, 9, Goldwin Smith 120.

Introduction: origin and nature of law; Babylonian and Hebrew law: Greek law. Main subject: history and elements of Roman law. Appendix: the influence of Roman law on English law and on the law of other countries.

7. **Seminary in Greek and Roman History.** Throughout the year, credit two hours a term. Professor SILL. T, 4 (or as may be arranged), Greek and Latin Seminary Room. Open to graduates and qualified undergraduates.

11. **The Middle Ages.** First term, credit three hours. Professor BURR. M W F, 9, Goldwin Smith 245.

A general survey of the history of Christendom from the eve of the Middle Ages to the dawn of the Renaissance (300-1300 A. D.), with especial attention to the life of society and the progress of civilization. Lectures and examinations.

12. **The Renaissance and the Reformation.** Second term, credit three hours. Professor BURR. M W F, 9, Goldwin Smith 245.

A study of the political, social, and religious history of Christendom during this age of transition (1300-1600 A. D.), with especial attention to the beginnings of modern life and thought. Lectures and examinations.

[13. **The Rise of Tolerance.** Throughout the year, credit two hours a term. Professor BURR.

A research class for study of the history of intellectual and religious liberty in Christendom. Open to seniors and graduates properly equipped in language and in history.] Not given in 1917-18.

14. **Medieval Life.** First term, credit one hour. Professor BURR. W, 4, Library, European History Seminary Room.

The study of some medieval chronicler, with a view to acquaintance with medieval life and facility in the reading of historical Latin. A reading knowledge of Latin (as much, say, as is needed to read Cæsar or Livy) is prerequisite.

15. **Seminary in Medieval History.** Second term, credit one hour. Professor BURR. W, 4, Library, European History Seminary Room.

A research class for the critical study of some period, event, or phase of medieval history. Open only to seniors and graduates.

16. **Canon Law.** Throughout the year, credit two hours a term. Professor BURR. T Th, 9.

The constitutional history of the Christian Church and the elements of ecclesiastical law. First term: to the end of the Middle Ages. Second term: since the end of the Middle Ages. Primarily for graduates, but open by permission to qualified seniors.

22. **History of Modern Europe.** Throughout the year, credit three hours a term. Professor BECKER. M W F, 3, Goldwin Smith 242.

A survey of European history from the beginning of the seventeenth century to the present. Political, economic, and intellectual movements will be emphasized in proportion to their international or European character and importance.

23. **The French Revolution.** First term, credit two hours. Professor BECKER. T Th, 3, Goldwin Smith 242.

A study of the Revolution from 1789 to 1795, with a preliminary survey of conditions in France before 1789. An elementary knowledge of modern European history is assumed on the part of the student, and a reading knowledge of French will be found of great advantage.

24. **The Napoleonic Era.** Second term, credit two hours. Professor BECKER. T Th, 3, Goldwin Smith 242.

A study of the organization of France under Napoleon, the establishment of the Napoleonic empire, the restoration of Europe in 1814-15, and the attempt to establish a European federation or Concert of the Powers from 1815 to 1825. Prerequisite course 22 or 23, or a satisfactory equivalent.

28. Seminary in Modern European History. Throughout the year, credit two hours a term. Professor BECKER. Library, European History Seminary Room. Hour to be arranged.

An opportunity for advanced students to undertake special investigation from the sources in some subject connected with the French Revolution or the intellectual history of the eighteenth century. Open to graduates and to properly prepared seniors.

52. American History, 1783 to 1850. First term, credit three hours. Professor HULL. M W F, 10, Goldwin Smith C.

A general course from the Revolution to the Compromise of 1850. Problems following the war; the formation of the new national government; European complications; the second war with Great Britain; new constitutional problems; the rise of the sectional issue. Textbook, lectures, reports, and readings.

53. American History, 1850 to 1898. Second term, credit three hours. Professor BRETZ. M W F, 10, Goldwin Smith C.

The trend toward secession and civil war, the Civil War, reconstruction, recent problems, political and constitutional. Textbook, lectures, and readings.

54. Economic History of the Colonies, 1600 to 1800. First term, credit three hours. Professor HULL. M W F, 9, Goldwin Smith 234.

Colonization and settlement as business enterprises; the agricultural conquest of the coast; the competition between slave, indentured, and free labor; the commerce of the British Empire and its relation to the American Revolution. Textbook, reading, reports, and lectures.

55. Economic History of the United States, since 1800. Second term, credit three hours. Professor HULL. M W F, 9, Goldwin Smith 234.

Commerce during the European wars; the introduction of manufactures; the westward movement; industrial differentiation of the sections; agriculture for export; the amalgamation of railways and the combination of industries. Textbooks, reading, reports, and lectures.

56. Constitutional History of the United States since 1860. First term, credit three hours. Prerequisite courses 52 and 53, or the equivalent. Professor BRETZ. M W F, 9, Goldwin Smith 236.

The course deals primarily with constitutional development since the Civil War, but attention is paid to current political questions of constitutional importance. A survey of recent constitutional development in the States is included.

57. Practice in Historical Investigation. First (also possibly second) term. Credit one hour a term. Professor HULL. First meeting, Wednesday, October 3, 4 p. m., Library, American History Seminary Room.

Topics for study will be drawn from the early history of Cornell University. Open, upon permission secured from the instructor, to such upperclassmen only as have satisfied him concerning their qualifications.

58. The Period of the Civil War. Second term, credit three hours. Prerequisite course 53 or the equivalent. Professor BRETZ. M W F, 9, Goldwin Smith 236.

This course deals with the political, constitutional, and military history of the years 1860-1865. The work will consist of reading and investigation of topics, with some lectures.

59. American History: The Settlement of the Middle West. First term, credit three hours. Professor BRETZ. M W F, 10, Goldwin Smith 234.

Exploration of the west, early settlers in the Ohio Valley, admission of states, disposal of the public lands, military and diplomatic relations with foreign powers in Northwest and Southwest.

60. **Constitutional History of the United States to 1860.** Second term, credit two hours. Prerequisite course 52. Professor HULL. M W F, 10, Goldwin Smith 234. Lectures, readings, and reports.

61. **Seminary.** Throughout the year, credit two hours a term. Professors HULL and BRETZ. First meeting, Thursday, October 4, 4 p. m., Library, American History Seminary Room.

71. **The Sciences Auxiliary to History.** First term, credit one hour. Professor BURR. S, 10, Library, European History Seminary Room.

A glance at the aims, the methods, the literature, and the use to history of the more important auxiliary sciences: anthropology, ethnology, archaeology, philology, epigraphy, palæography, diplomatics, sphragistics, numismatics, heraldry, genealogy, chronology, geography. Not open to underclassmen.

72. **Historical Geography.** Throughout the year, credit one hour a term. Professor BURR. S, 11, Library, European History Seminary Room.

A thorough study of the geography of history. Not open to underclassmen, and intended for those who have given much attention to history.

73. **Palæography and Diplomatics.** Throughout the year, credit one hour a term. Professor BURR. S, 12, Library, European History Seminary Room.

The reading of manuscripts and the interpretation of documents. Attention is devoted chiefly to the palæography of Latin and the languages using the Latin alphabet (e. g., English, French, German, Italian). The course is a first-hand study of the manuscripts and facsimiles in the University collection.

75. **Historical Method.** First term, credit one hour. Professor BURR.

History: its nature, its scope, its materials, its methods. Open only to seniors and graduates, and intended especially for those who are looking forward to the teaching of history or to historical research.] Not given in 1917-18.

76. **The Teaching of History.** Course for teachers. Second term, credit two hours. S, 8-10, Library, European History Seminary Room. Professor BURR with aid from his colleagues. Open only to seniors and graduates who are specializing in history.

77. **Introduction to the Literature of History.** A general survey, period by period, of the sources and literature of history. F, 3 (or as may be arranged). First meeting, Friday, October 5, European History Seminary Room. Professors SCHMIDT, SILL, BURR, BECKER, HULL, BRETZ. For graduates only.

Oriental History. See Semitic Languages and Literatures, courses 9a, 9b.

POLITICAL SCIENCE

51. **Elementary Economics.** Throughout the year, credit three hours a term. One lecture and two recitations each week. Lectures, M, 9; repeated M, 11. Barnes Auditorium. Professor DAVENPORT. Recitations, T Th, 8, 9, 10, 11, 12; W F, 8, 9, 10, 11, 12. Assistant Professors USHER and REED, Dr. KNIGHT, Mr. HUGINS, Mr. KOCHENDERFER, and Mr. WORKING. Section assignments made at the first lecture.

An introduction to economics including a survey of the principles of value, money, banking, and prices; international trade; free trade and protection; wages and labor conditions; the control of railroads and trusts; socialism; principles and problems of taxation.

52. **Elements of Economics.** Throughout the year, credit two hours a term. Mr. CAMPBELL. Lectures T, 9, and T, 11, Goldwin Smith A. Recitations W Th F, 9, 10.

A special course for students in civil and mechanical engineering. Not open to students in other colleges. A general survey of economic problems. Lectures, textbook, readings, and reports.

53a. **Political Institutions.** First term, credit three hours. Lectures, M W, 10, Goldwin Smith B, Professor ORTH; quiz hours to be arranged, Assistant Professor SABY.

An introduction to the study of politics, with special reference to American government. Lectures, readings, reports, quizzes. Students desiring to specialize in politics should take this course in their junior year.

53b. Comparative Politics. Second term, credit three hours. Lectures, M W, 10, Goldwin Smith B, Professor ORTH; quiz hours to be arranged, Assistant Professor SABY.

A study of the political institutions of the leading European countries, with special reference to constitutionalism and the representative system, imperialism and nationalism. Lectures, readings, reports, quizzes.

54a. Municipal Administration. First term, credit three hours. Prerequisite course 53a. Assistant Professor SABY. T Th S, 9, Goldwin Smith 245.

A study of the development of municipal government, special attention being paid to American conditions.

Lectures, readings, and reports. Each student will be required to make a somewhat detailed study of some city.

54b. State Administration. Second term, credit three hours. Prerequisite course 53a. Professor ORTH. M W F, 11, Goldwin Smith 256.

A study of the government of the American State: its relation to local government; the powers and functions of administrative boards and commissions; judicial control.

Lectures, readings, and reports. Each student will be required to make a somewhat detailed study of some particular state.

54c. Municipal Problems. Second term, credit three hours. Prerequisite course 53a. Assistant Professor SABY. T Th S, 9, Goldwin Smith 245.

A study of special problems in municipal functions: the street railway, water and gas supply, health, police, charity and correction, education, recreation, etc. Lectures, readings, and reports. Each student will be required to make a detailed study of some problem.

55a. Elementary Social Science. First term, credit three hours. Course 51 should precede or be taken with this course. Professor WILLCOX. T Th S, 9, Goldwin Smith 256.

An introductory course upon social science or sociology, its field and methods, with special reference to the human family as a social unit, to be studied by the comparative, the historical, and the statistical methods.

55b. Elementary Social Science. Second term, credit three hours. Course 51 should precede or be taken with this course. Professor WILLCOX. T Th S, 9, Goldwin Smith 256.

A continuation of the preceding course but with especial reference to the dependent, defective, and delinquent classes. Open to all who have taken 55a and by special permission to others.

56a. Elements of Business Law. First term, credit two hours. Professor ORTH. T Th, 12, Goldwin Smith B. Lectures, textbook, quizzes. Open to upperclassmen in all colleges except Law.

A brief survey of that portion of private law which deals especially with contracts, negotiable instruments, agency, and sales.

56b. Government Control of Industry. Second term, credit three hours. Prerequisite course 56a. Professor ORTH. T Th, 12, Goldwin Smith B. Lectures, reports, quizzes. Open to upperclassmen in all colleges except Law.

A scrutiny of the policy of governmental control of industry from the legal and political point of view, emphasis being laid on the development of the police power and its application to the regulation of corporations and private enterprises.

Courses 56a and 56b are designed primarily to meet the needs of students who contemplate entering business and not the profession of law, and credit for these courses will not be given to law students.

57b. Lectures on Citizenship. Second term, credit one hour. M W, 12, Goldwin Smith B.

A lecture each Monday by a non-resident lecturer and each Wednesday by a member of the Department. The course has been arranged by a committee of

Alumni who are actively engaged in civic and social work and who are coöperating in this way with the Department. It will follow the same general plan as last year, but the speakers and most of the subjects treated will be changed. The course will be under the general charge of Professor WILLCOX. Reading, reports, and essays will be required.

58a. Elements of Accounting. Repeated in second term, credit three hours. Prerequisite course 51 or its equivalent. Assistant Professor ENGLISH. First term, T Th S, 8; second term, M W F, 8, Goldwin Smith C.

Theory of debit and credit; the journal and ledger; the development of books of original entry; analysis of income sheets and balance sheets.

58b. Principles of Accounting. Repeated in second term, credit three hours. Prerequisite course 58a. Assistant Professor ENGLISH. First term, M W F, 8; second term, T Th S, 8, Goldwin Smith 142.

The issue and transfer of capital stock; bonds and their valuation; depreciation; reserves and reserve funds; sinking funds; analysis of income sheets and balance sheets.

59a. Cost Accounting. First term, credit three hours. Prerequisite course 58b. Assistant Professor ENGLISH. M W F, 10, Goldwin Smith 256.

A study of the principal types of cost accounting systems and of the relation of cost accounts to financial accounts.

59b. Accounting Problems. Second term, credit three hours. Prerequisite course 58b. Assistant Professor ENGLISH. M W F, 10, Goldwin Smith 256.

A study of the accounting problems which arise in the organization, reorganization and liquidation of business enterprises.

[60. The American Party System. First term, credit two hours. Prerequisite course 53a. Professor ORTH.

A study of the evolution of the American political party; its relations to the machinery of government; election laws; the development of state control over the machinery of party. Lectures, readings, and reports.] Not given in 1917-18.

62. Industrial Organization. First term, credit two hours. Prerequisite courses 51 and 58a; or 58a may be taken at the same time. Professor KIMBALL. T Th, 12, Sibley 4.

Seniors, and graduates; others by permission. See I 11 Sibley College.

63a. Corporation Finance. First term, credit three hours. Prerequisite course 58a. Professor YOUNG. T Th S, 11, Goldwin Smith 256.

A study of the business corporation, with special reference to its economic significance and effects and to the problems of its legal control, including an analysis of the financial operations of railroads, public utilities, and industrial corporations.

63b. Monopoly and Competition. Second term, credit three hours. Prerequisite course 63a. Professor YOUNG. T Th S, 11, Goldwin Smith 256.

The regulation of competition, the conditions of monopolization, the problems of industrial combination, the public control of the rates and services of railroads and public utilities.

64. Money and Banking. Throughout the year, credit three hours a term. Prerequisite course 51. Professor YOUNG. T Th S, 10, Goldwin Smith 142.

A discussion of the more important phases of the theory of money and credit is followed by a consideration of selected practical problems, including the revision of the American banking system. Practical work is required in the analysis of the controlling conditions of the money market, of organized speculation in securities, and of foreign exchange.

[65a. The Industrial Revolution in England, 1700 to 1850. First term, credit three hours. Prerequisite course 51, previously or concurrently, or work in European history. Assistant Professor USHER.

The topography and resources of England, the Industrial Revolution, commercial expansion in the eighteenth century, the history of the Bank of England, the rise of London as a world metropolis.] Not given in 1917-18.

[65b. **Social and Economic Problems of the 19th Century in England.** Second term, credit three hours. Prerequisite course 51, previously or concurrently. Assistant Professor USHER.

The course can be followed most profitably by students who have taken course 65a, but it may be elected independently. The history of English agriculture, 1700 to 1907; the poor laws, 1834 and 1909; the coming of free trade, 1776 to 1846; railroads and rate-making; Germany and the industrial supremacy of England.] Not given in 1917-18.

66a. **The Labor Problem.** Second term, credit two hours. Prerequisite course 51. Mr. CAMPBELL. M W, 11, Goldwin Smith 264.

This course will present a systematic view of the progress and present condition of the working class in the United States and in other industrial countries; sketch the history and analyze the aims and methods of labor organizations; study the evolution of institutions designed to improve the condition of the working class; and compare the labor legislation of the United States with that of European countries.

66b. **Socialism.** Second term, credit three hours. Prerequisite course 51. Dr. KNIGHT. M W F, 10, Goldwin Smith 264.

This course will give due attention to the various forms of socialistic theory. Its main object, however, is to describe the evolution of the socialist movement and the organization of socialistic parties, to measure the present strength of the movement, and to examine in the concrete its methods and aims.

70a. **Public Finance.** First term, credit two hours. Prerequisite course 51. Mr. CAMPBELL. M W, 11, Goldwin Smith 256.

Theories of public expenditure; the direction of public expenditures in cities, states, and in the nation; classification of public expenditures; budget making in theory and practice; public revenues, including taxes, fees, prices, and special assessments; the levy and collection of federal, state, and local taxes; principles of taxation.

73. **Insurance.** Second term, credit three hours. Prerequisite course 51. Assistant Professor REED. T Th S, 11, Goldwin Smith 264.

The topics will include: the historical development and economic aspects of insurance, construction of mortality tables, calculation of the premium, organization and investments of insurance companies, state control of insurance. Some attention will be devoted to the principles of property insurance, but chief emphasis will be placed on problems of life insurance.

76a. **Elementary Statistics.** First term, credit three hours. Prerequisite course 51. Professor WILLCOX. M W F, 9, Goldwin Smith 256. Laboratory, W, 2-4, Goldwin Smith 259.

An introduction to census statistics with especial reference to the federal census of 1910, and to registration statistics with especial reference to those of New York State and its cities. The course gives an introduction to the methods and results of statistics in these, its best developed branches.

76b. **Economic Statistics.** Second term, credit three hours. Prerequisite course 51. Professor WILLCOX. M W F, 9, Goldwin Smith 256. Laboratory, W, 2-4, Goldwin Smith 259.

A continuation of course 76a, dealing mainly with the agricultural and industrial statistics of the United States. Mature students that have not already had course 76a or its equivalent may be admitted by special permission. The course is an introduction to statistics in its application to more difficult fields, such as production, wages, prices, and index numbers.

78a. **International Law and Diplomacy.** First term, credit three hours. President SCHURMAN and Assistant Professor SABY. M W F, 12, Goldwin Smith B. Lectures, textbook, and reports. Open to upperclassmen in Arts and Sciences, to students in Law, and to approved upperclassmen in other colleges.

While this course aims to present a systematic view of the rights and obligations of nations in times of peace and war, it particularly emphasizes our contemporary international problems and the participation of the United States in the development of international law.

[78b. **Constitutional Government.** Second term, credit three hours. Prerequisite course 53a. Professor ORTH. Lectures, textbook, and reports.

A study of the development of the American constitutional system.] Not given in 1917-18.

[79a. **History of Political Thought.** First term, credit two hours. Prerequisite course 53a. Assistant Professor SABY.

A study in the development of political thought from the Greeks to modern times in its relation to the history and development of political institutions. Lectures, textbook, and assigned readings.] Not given in 1917-18.

79b. **Modern Political Thought.** Second term, credit three hours. Prerequisite course 53a. Assistant Professor SABY. M W F, 9, Goldwin Smith 264.

A general survey of the more important modern political movements. Ideas and ideals underlying the present political unrest. The different political ideas that have at different times striven for supremacy in American political life. Lectures, textbook, and assigned readings.

80. **Commercial Policies and Imperialism.** First term, credit three hours. Prerequisite course 51. Assistant Professor USHER. M W F, 12, Goldwin Smith 264.

The course will cover the following topics: Systems of economic policy; Mercantilism, cameralism, laissez faire, the Kultur theory, and modern English Liberalism; the history of the German Customs Union; the establishment of the free trade policy in England; colonial expansion in Africa.

81. **The History of Price Making and the Growth of Produce Exchanges.** Second term, credit three hours. Prerequisite course 51; open by special permission to those who have had courses in European history. Assistant Professor USHER. M W F, 12, Goldwin Smith 264.

A study of the problems of marketing staple crops. The method will be primarily historical and descriptive, but attention will be given to theoretical and statistical analysis of prices in the modern speculative markets.

87a. **Principles of Economics.** First term, credit three hours. Professor DAVENPORT. M W F, 11, Goldwin Smith 264. Prerequisite course 51 or its equivalent.

An advanced course in general economics, based upon Davenport's *Economics of Enterprise* as a text. Especial attention will be given in this course to the laws of value and price, of wages, interest, and profit.

87b. **Public Revenues.** Second term, credit three hours. Prerequisite course 51 and preferably course 87a. Professor DAVENPORT. T Th S. 9, Goldwin Smith 264.

88. **Value and Distribution.** Throughout the year, credit two hours a term. Professor DAVENPORT. F, 2.30, Political Science Seminary.

A study of the chief problems of current economic theory. The works of the leading economic writers will be critically studied with a view to disclosing the basis of existing divergencies in point of view.

89. **Mathematical Economics.** Throughout the year, credit two hours a term. Professor YOUNG. Hours to be arranged.

The use of mathematics in economic analysis, with special reference to the work of Cournot, Jevons, Edgeworth, Walras, Pareto, Auspitz and Lieben, and Fisher. Primarily for graduates.

90. **General Problems of Economic History.** First term, credit two hours. Assistant Professor USHER. Hours to be arranged.

The topics studied will include: The generalizations of the German Historical School, stages in the evolution of industry, forms of medieval and modern commercial organization, the origin of property in land, the decay of the Three Field

System, systems of economic policy. The problems of theory involved will be emphasized. Primarily for graduates.

91. **Research in Statistics.** Throughout the year, credit to be arranged. Professor WILLCOX.

92. **Research in Finance.** Throughout the year, credit two or three hours a term. Professor YOUNG. Hours to be arranged.

Individual or coöperative investigations of selected problems in money, banking, and corporation finance, in connection with lectures upon the sources of information and upon the use of appropriate methods of investigation.

93. **Research in Accounting.** Throughout the year, credit two or three hours a term. Assistant Professor ENGLISH. Hours to be arranged.

For especially qualified students interested in particular accounting problems.

94. **Research in Politics.** Throughout the year, credit one to three hours a term. Professor ORTH. Hours to be arranged.

A research course for advanced students in public law and political science.

95. **Seminary in Political Science and Public Law.** Throughout the year, credit two hours a term. Professor ORTH. W, 2.30, Political Science Seminary.

An advanced course for the study of some special topic to be announced. Open to especially qualified students by permission of the professor in charge.

99. **General Seminary.** Throughout the year, credit two hours a term. Conducted by members of the department. M, 2.30-4.30, Political Science Seminary. Open only to graduate students.

Rural Economy. See Rural Economy in College of Agriculture.

BIBLIOGRAPHY

1. **Bibliography.** First term, credit two hours. Librarian AUSTEN. T Th, 12, Library, Political Science Seminary Room.

A study of classification, cataloguing, indexing, illustrating, binding, preparation of manuscripts, etc.

2. **Bibliography.** Second term, credit one hour. Librarian AUSTEN. T, 12, Library, Political Science Seminary Room.

Writing and bookmaking in ancient times. Printing and bookmaking in the Middle Ages. Lectures and reference reading.

MUSIC

The courses offered by the Department of Music are designed to afford to all students having sufficient native ability, the opportunity to study music as a part of the college course. The aim is to make musical training contribute to liberal culture.

1. **Elementary.** Throughout the year, credit two hours a term. Open to all students showing sufficient aptitude to pursue the subject with profit. Professor DANN. T, 7.15 p. m.; Th, 4.45 p. m., Sage Chapel.

Ear training, sight reading, and elementary theory, including construction of the major scale (without key signature); normal, harmonic, and melodic minor scales; notation of chromatic scale with each key-signature; intervals, triads and their inversions. Attendance is required at the Sunday morning service at Sage Chapel for which service the members of this class form the choir.

3. **Intermediate.** Throughout the year, credit two hours a term. Open to students who have completed course 1 or who meet the requirements prescribed in course 1. Professor DANN. Hours to be arranged. Sage Chapel.

Advanced musical dictation, melody writing, more advanced sight reading and study of standard sacred and secular music.

5. **Choral.** Throughout the year, credit one hour a term. Open to any student possessing a voice of satisfactory quality and volume, who is qualified to sing the larger choral works given at the annual music festival. Professor DANN. First term, Th, 7.15 p. m.; second term, M W, 7.15 p. m., Sage Chapel.

General vocal training, including posture, breathing, the study of vowels and consonants as applied to singing, together with intensive study of the larger choral compositions. Members of this class form a part of the festival chorus.

7. Advanced Choral. Throughout the year, credit two hours a term. Professor DANN. M, 7.15 ; T, 4.45; Sunday, 2.30, Sage Chapel.

Preparation and public presentation of the best choral works, sacred and secular. This course is offered as advanced training to students possessing good singing voices and the ability to read at sight music of moderate difficulty. The class is limited to one hundred and eight members, distributed approximately as follows: thirty-two sopranos, twenty-four contraltos, twenty-two tenors, and thirty basses. All vacancies are filled by competition at the beginning of the first term.

Members of this class constitute the choir at the Sunday Vesper service in Sage Chapel and form a part of the festival chorus.

10. Harmony. Prerequisite course 1, or the equivalent. Throughout the year, credit two hours a term. Assistant Professor QUARLES. M W, 10 a. m., Sage Chapel.

12. Advanced Harmony and Elementary Form. Open to students who have completed course 10 and to others equally qualified. Throughout the year, credit two hours a term. Assistant Professor QUARLES. M W, 12 m., Sage Chapel.

14. Applied Form and Composition. Open to students who have completed course 12, and to others equally qualified. Throughout the year, credit two hours a term. Assistant Professor QUARLES. M W, 11 a. m., Sage Chapel.

It is recommended that courses 14 and 16 be taken simultaneously.

16. Counterpoint. Open to students who have completed course 12, and to others equally qualified. Throughout the year, credit two hours a term. Assistant Professor QUARLES. T F, 11 a. m.

18. History and Appreciation of Music. No preliminary training required. Throughout the year, credit two hours a term. Assistant Professor QUARLES. T F, 12 m., Sage Chapel.

The purpose of this course is to furnish an intelligent basis for the appreciation of all branches of musical composition. General survey of the historical development of music from the earlier times to the present. Analytical outline of forms used by the masters. Illustration with organ, piano, and self-playing instruments. The programmes of the University concerts are taken up and discussed. Essays, lectures, quizzes, and collateral reading.

Individual examinations for admission to all courses in music, for new students and others not previously classified, will be held as follows:

Courses 1, 3, 5, and 7 daily, Tuesday, September 25, to Saturday, September 29 inclusive, 3.30 to 5.30, Sage Chapel.

Courses 10, 12, 14, 16 and 18, Tuesday, September 25, Wednesday, September 26 and Thursday, September 27, 11 to 12.30, Sage Chapel.

MATHEMATICS

Examinations for the removal of conditions in courses 1-8 are held in September just before registration. Similar examinations are held in April for the removal of conditions incurred at the end of the first term. For further information regarding the time and place of these examinations, students should apply to the Department.

All students taking any of the courses from 1 to 8 inclusive should go to White 5 on one of the registration days at the beginning of each term, for assignment to sections.

1. Solid Geometry. Repeated in second term, credit three hours. First term, T Th S, 10; second term, M W F, 10.

Open to all students, but intended especially for those who have entered with the minor requirements in mathematics and who are preparing: (a) to teach mathematics in the secondary schools; (b) to take up engineering work later in the course; (c) to specialize in chemistry or physics.

2. Advanced Algebra. Repeated in second term, credit five hours. Daily exc. S, 9.

Open to all students, but designed especially for those mentioned under course 1.

2 (F). **Advanced Algebra.** First term, credit three hours. M W F, 9.

Open to students who have met the entrance requirements in intermediate algebra. The work covered is the equivalent of that required in this subject for admission to courses 5, 6, 7, or 8.

3. **Plane Trigonometry.** Repeated in second term, credit three hours. First term, M W F, 10; second term, T Th S, 10.

Open to all students, but designed especially for those mentioned under course 1.

Further information concerning the subject matter of courses 5, 6, 7, or 8 may be obtained by applying to the Department.

5. **Analytic Geometry and Calculus.** For students in the College of Civil Engineering. Prerequisite courses 1, 2, and 3, or their equivalent.

5 (1). First term, daily except S, credit five hours. Repeated in the second term.

5 (2). A continuation of the work of 5 (1). Second term, daily except Saturday.

6. **Analytic Geometry and Calculus.** Primarily for students in Sibley College. Prerequisite courses 1, 2, and 3, or their equivalent.

6 (1). First term, daily, credit six hours. Repeated in the second term.

6 (2). A continuation of the work of 6 (1). Second term, daily, credit six hours. Repeated in the first term of the following year.

7. **Analytic Geometry and Calculus.** Throughout the year. Prerequisite courses 1, 2, and 3, or their equivalent. Recommended for students intending to specialize in physics or chemistry.

7 (1). First term, daily except S, credit five hours. Repeated in the second term.

7 (2). A continuation of the work of 7(1). Second term, daily except S, credit five hours.

8. **Analytic Geometry and Calculus.** Primarily for students in the College of Architecture. Throughout the year, credit three hours a term. Prerequisite courses 1, 2, and 3, or their equivalent. Sec. 1, M W F, 8. Sec. 2, T Th S, 8.

Students wishing to take any of the following courses are asked to meet in White 5 on Thursday, September 27, at 3.30 p. m., to arrange their schedules.

15. **Elementary Course in Higher Mathematics.** Throughout the year, credit two hours a term. Prerequisite courses 1, 2, and 3, or their equivalent. Assistant Professor CARVER, and Dr. SILVERMAN. T Th, 11, White 5.

Intended for students who do not plan to take many courses in mathematics, but who nevertheless wish to become acquainted with the principal ideas of modern mathematics. The object will be to make clear the fundamental aims, methods, and results of a number of subjects, rather than to develop the technique of any one subject. The course will deal with theory of numbers, vector analysis, groups; advanced synthetic geometry, including some topics in projective, noneuclidean, and higher dimensional geometry; analytic geometry, calculus, famous problems of mathematics; algebra of logic, foundations of mathematics. Lectures, assigned reading, and exercises.

20. **Teachers' Course.** Throughout the year, credit three hours a term. Assistant Professor CRAIG. M W F, 10, White 4.

The course will include a review of the methods of proof of the important topics in algebra and geometry. An attempt will be made to give a perspective to elementary mathematics by showing the coordination between the parts.

23. **Modern Algebra.** First term, credit three hours. Assistant Professor RANUM. White 9.

This course will include determinants, linear dependence, matrices, linear transformations, bilinear forms, quadratic forms, and elementary divisors, and will emphasize their applications to geometry.

24. Theory of Equations. Second term, credit three hours. Prerequisite course 7 or its equivalent. Dr. GABA.

Transformations and general properties of algebraic equations; symmetric functions; determinants; general theory of elimination, etc.

26. Theory of Groups. Second term, credit three hours. Prerequisite course 7 or its equivalent. Assistant Professor CARVER. M W F, 11, White 21.

An elementary course, restricted for the most part to the study of finite groups. Among the topics to be treated are groups of motions, permutation and transformation groups, abstract group properties, and isomorphism.

41. Elementary Differential Equations. Throughout the year, credit three hours a term. Prerequisite course 7 or its equivalent. Mr. BETZ. T Th S, 9, White 21.

An introduction to the study of ordinary and partial differential equations and their application to problems of mathematical physics.

42. Advanced Calculus. Throughout the year, credit three hours a term. Prerequisite course 7 or its equivalent. Assistant Professor GILLESPIE. T Th S, 10, White 1.

The course is a study of the processes of the calculus, their meaning and applications. It is designed to furnish a necessary preparation for advanced work in analysis and applied mathematics.

44. Topics in Convergent and Divergent Series. Throughout the year, credit three hours a term. Prerequisite course 42. Dr. SILVERMAN. White 6.

61. Projective Geometry. Throughout the year, credit three hours a term. Prerequisite course 7 or its equivalent. Professor SNYDER. M W F, 9, White 24.

The elements of projective geometry treated synthetically.

62. Advanced Analytic Geometry. Throughout the year, credit three hours a term. Prerequisite course 7 or its equivalent. Dr. GILMAN. White 6.

Homogeneous coordinates; transformation by reciprocal polars; projection; anharmonic properties of conics.

63. Algebraic Curves. Throughout the year, credit three hours a term. Prerequisite courses 61 and 62. Dr. MCKELVEY. White 25.

The topics to be studied include Plücker's numbers, birational transformations and linear systems of curves.

67. Differential Geometry. Second term, credit three hours. Prerequisite courses 7 and 41. Assistant Professor RANUM. White 9.

Applications of the calculus to the metric geometry of curves and surfaces, including the curvature and torsion of space curves, the parametric equations, conformal representation, and curvature; asymptotic lines, links of curvature, and geodesics.

80. Differential Equations of Mathematical Physics. Throughout the year, credit three hours a term. Assistant Professor HURWITZ. Hours to be arranged, White 6.

The derivation of the differential equations, with appropriate boundary conditions, which arise in certain problems of mathematical physics; the mathematical properties of solutions and the physical meanings of these properties. No previous work in solving differential equations is required, but Mathematics 42 or its equivalent is essential.

81. Introduction to Mathematical Physics. Throughout the year, credit three hours a term. Assistant Professor OWENS. White 2.

A general study of mechanics, heat, electricity,*etc., with special attention to the mathematical statement of problems and the interpretation of results.

83. Theory of Probabilities. Throughout the year, credit three hours a term. Professor MCMAHON. White 10.

Theory of probabilities with applications to problems in statistics, theory of errors, life-tables, insurance, correlation, etc., to suit individual needs. A knowledge of calculus is desirable but not essential. The work is arranged so that students may begin at mid-year without much inconvenience.

83a. Introduction to Actuarial Science. Throughout the year, credit three hours a term. Prerequisite courses 7 and 83, or equivalents. Professor McMAHON. White 10.

Based on the "Recommendations of the Educational Committee of the Actuarial Society of America". Under certain conditions students may be admitted to the class at mid-year.

85. Vector Analysis. First term, credit three hours. Prerequisite course 7 and a knowledge of elementary physics. Assistant Professor SHARPE.

This course is intended primarily for graduate students in physics and engineering. Numerous applications will be given to geometry, mechanics, and electrodynamics.

86. Potential Function and Fourier's Series. Throughout the year, credit three hours a term. Assistant Professor CRAIG. White 4.

This course, introductory to the subject, will be arranged to suit the needs of the class.

ASTRONOMY

1. General Astronomy. First term, credit three hours. No prerequisite, but a knowledge of elementary physics is desirable. Lectures and recitations illustrated by lantern slides and by the observatory equipment. Professor LELAND. M W F, 12, McGraw, Geological Lecture Room.

A fundamental course in descriptive astronomy including a comprehensive study of the structure of the universe and the heavenly bodies, their motions, relations, and evolutions; methods of investigation; instruments and apparatus.

2. Observations. Second term, credit one hour. Prerequisite course 1. Professor LELAND. One evening per week. Two sections, Sec. 1, Monday evening; sec. 2, Tuesday evening at 7.30. Observatory.

A general study of the constellations, the sun and the planets, double and multiple stars, and nebulae. Identification of stars. Location of objects from given co-ordinates. Use of star maps.

3. Astronomical Laboratory. Second term, credit one hour. Prerequisite course 1. Professor LELAND. One afternoon per week. Th, 2.30, Observatory.

Supplemental to course 1. Elementary laboratory problems to illustrate the principles of astronomy and astronomical apparatus. Observations of the sun.

PHYSICS

Examinations for those who were unavoidably absent from either term examination in courses 2 to 7, and for those who have conditions to make up, will be held on Monday, September 24, 1917, at 9 a. m. in Rockefeller C. Similar examinations in connection with courses 8, 9, 9c, 10, and 14 will be held in Rockefeller C at 2 p. m. on the same day. Students expecting to take any of these examinations should notify the department not later than September 17, 1917.

Courses in physics which are required by various colleges or departments of the University are indicated below. For the terms in which these courses are to be taken the student should consult the Announcement of the college or department concerned. Agriculture, Physics 2; Chemistry (B. Chem.), Physics 2, 10 (2 hours), 9c, 14 (4 hours); Civil Engineering, Physics 2, 7, 14 (2 hours); Mining Engineering, Physics 2, 7, 14 (4 hours); Mechanical and Electrical Engineering, Physics 3, 8, 9, 14 (4 hours); Veterinary College, Physics 2.

Students preparing for the Cornell University Medical College should take Physics 2 and 10 (3 hours).

Students intending to follow physics as a profession, either in education or in technical physics, for which there is an increasing field in the industries as well as in research and testing laboratories, should consult the Department as to their choice of courses.

2. Introductory Experimental Physics. Repeated in second term, credit five hours. Three lectures and two class-room periods a week. Lectures: T Th S, 9; M W F, 11, Rockefeller A. Professors NICHOLS, MERRITT, and SHEARER, and Assistant Professor GIBBS. Class-room work: Assistant Professor

GIBBS, and Messrs. BAILEY, GRANTHAM, KENNARD, MALLORY, MORATH, RODGERS, and WEEKS. Hours to be arranged. Required of candidates for B.Chem., C.E., B.S., and D.V.M.

Entrance physics is not accepted as an equivalent of this course.

3. Introductory Experimental Physics. Primarily for students in mechanical and electrical engineering. Repeated in second term, credit six hours. Three lectures and three class-room periods each week. Lectures: T Th S, 9; M W F, 11, Rockefeller A. Professors NICHOLS, MERRITT, and SHEARER, and Assistant Professor GIBBS. Class-room work: Assistant Professor GIBBS, and Messrs. BAILEY, BIDWELL, GRANTHAM, MORATH, and RODGERS. Hours to be arranged.

Entrance physics is not accepted as an equivalent of this course.

4a. General Physics. Primarily for Arts students. Class-room work covering heat, magnetism, and electricity. First term, credit three hours. Prerequisite course 2 or 3. Assistant Professor GIBBS. M W F, 8.

4b. General Physics. Primarily for students in Arts and Sciences. Class-room work covering properties of matter, sound, and light. Second term, credit three hours. Prerequisite Physics 2 or 3. Assistant Professor GIBBS. M W F, 8.

Physics 4a and 4b are designed to meet the needs of Arts students who desire a somewhat detailed survey of the field of physics in preparation either for teaching or for more advanced courses. Course 4a may be taken either before or after 4b.

7. General Physics. Primarily for students in civil engineering. Class-room work. Repeated in second term, credit three hours. Prerequisite Physics 2. Messrs. MURDOCK and MALLORY. Hours to be arranged.

8. Properties of Matter, Electrostatics, and Magnetism. Theory. Primarily for students in mechanical and electrical engineering. Second term, repeated first term following year, credit two hours. Prerequisites Physics 3, and Mathematics 6 (1). Mathematics 6 (2) must be taken in parallel. Assistant Professor RICHTMYER, and Messrs. BIDWELL, BROWN, GERMANN, JENNESS, KING, PIDGEON, SCHELLENG, and SIVIAN. Second term: eight sections, as arranged. First term: one section, as arranged. Rockefeller.

Textbook work in statics, dynamics, properties of matter, electrostatics, and magnetism.

9. Current Electricity and Heat. Theory. Primarily for students in mechanical and electrical engineering. Repeated in second term, credit two hours. Prerequisite Physics 8. Instructing staff as in Physics 8. First term: eight sections, as arranged. Second term: one section as arranged. Rockefeller.

Textbook work. A continuation of Physics 8. Current electricity, heat including thermometry, expansion, calorimetry, radiation, conduction, properties of vapors, and an introduction to the kinetic theory of gases and thermo-dynamics.

9c. Magnetism, Electricity, and Heat. First term, credit two hours. Required of candidates for B. Chem. Prerequisites: Physics 2, two hours of Physics 10, and two hours of Physics 14. Two additional hours of 14 must be taken with 9c. Mr. KING. Rockefeller as assigned.

Two recitations per week at hours to be arranged.

10. Introductory Physical Experiments. Either term or throughout the year, credit one to three hours a term. May be elected by students that are taking or have completed Physics 2, 3, 4, or 7. Assistant Professor RICHTMYER, and Messrs. JENNESS, PEARSALL, SMITH, and TYNDALL. T Th, 10-12.30; S, 8-10.30; S, 10.30-1; M T Th F, 2-4.30. Rockefeller 220-232.

Two hours covering properties of matter, heat, light, sound, magnetism, and electricity may be taken for one term, the student electing two laboratory periods a week; or the course may be extended over two terms, one period a week being taken. A longer course of three hours may be elected covering the same ground as the two hour course but more in detail, the work being done in one term or distributed over two terms.

Students who have done laboratory work in physics in high school should present their notebooks before starting Physics 10. A special schedule of experiments to suit individual needs may then be arranged.

12. Physical Experiments. Primarily for students in the College of Arts and Sciences. Either term or throughout the year, credit one to four hours a term. Prerequisites at least eight hours of physics, taken from Physics 2, 3, 4, 7, and 10, or the equivalent. Assistant Professor RICHTMYER and Mr. BIDWELL. T Th, 8-11, 9-12, 10-1, and Th, 2-5. Rockefeller 250-257. Students electing two hours of University credit take one three-hour period a week.

Quantitative laboratory work in mechanics, heat, light, sound, electricity, and magnetism, with special reference to methods of measurement, sources of error and their elimination, the adjustment and use of instruments of precision, graphical methods of interpreting results. Includes also a limited number of experiments, more or less qualitative, dealing with such physical phenomena as gyroscopic action, electrical waves, photo-electricity, radio activity, various spectra, etc.

14. Physical Experiments. Primarily for candidates for B.Chem., C.E., and M.E. Either term or throughout the year, credit one to four hours a term. Prerequisite analytic geometry and the calculus; and at least seven hours of Physics taken from preceding courses, or Physics 3 if Physics 8 and 9 be taken in parallel, or the equivalent. Assistant Professor RICHTMYER, and Messrs. BIDWELL, BROWN, GERMANN, PIDGEON, SCHELLENG, SIVIAN, BITNER, KOLLER, MOORE, and PEARSALL. Eight sections as assigned. Rockefeller 250-257.

Physical measurements, properties of matter, mechanics, heat, light, sound, magnetism, and electricity; the adjustment and use of instruments of precision. Results and errors are carefully discussed. Required in certain courses as noted above.

17. Practice Course for Teachers. Second term, credit three hours. Prerequisite Physics 2, and two hours of Physics 10, or the equivalent. Students expecting to teach high school physics should take at least Physics 4 in addition. Attention will be given to the choice and arrangement of subject matter in a high school course, and to the selection of experiments suitable for demonstration and laboratory work where a limited equipment is available. Opportunity will be offered for practice in repairing apparatus, and in constructing simple pieces of apparatus. Assistant Professor GIBBS.

18. Theory and Practice of Photography. Repeated in second term, credit two hours. Prerequisite, the knowledge of chemistry and physics that in general is possessed by those who have completed Chemistry 1 and Physics 2. Professor NICHOLS and Mr. RODGERS, and Miss SEVERANCE. Lecture, T, 4, and one three-hour laboratory period weekly; M Th F, 2-5, or W Th, 9-12, Rockefeller, third floor north. Lectures in Rockefeller A.

19. Advanced Photography, with special reference to its application to research. Repeated in second term, credit two hours. Prerequisite courses 2, 10 or 14, and 18, or the equivalent. Professor NICHOLS. Rockefeller Hall, Photographic Laboratory.

Courses 20-25 are intended to give a more extensive and broader study of various topics in general physics than time will permit in the more elementary courses described above. These courses are also introductory to the appropriate advanced courses. Some previous work in general physics is necessary, but the requirements depend on the individual student and on his general training. Students desiring to enter any of these courses should first consult the instructor in charge.

20. Heat. First term, credit five hours. Assistant Professor BLAKER. M T W Th F, 9, Rockefeller C.

[**21. Light.** Second term, credit five hours. Assistant Professor BLAKER.] Not given in 1917-18.

22. Electricity and Magnetism. Second term, credit five hours. Assistant Professor BLAKER. M T W Th F, 9, Rockefeller C.

[23. **Properties of Matter.** First term, credit five hours. Assistant Professor BLAKER.] Not given in 1917-18.

[24. **Sound.** Second term, credit two hours. Assistant Professor BLAKER.] Not given in 1917-18.

25. **Advanced Laboratory Practice.** Either term or throughout the year. Credit one to three hours a term. Assistant Professor BLAKER. One to three three-hour periods a week at hours to be arranged.

A laboratory course in general physics for students who desire to teach experimental physics or who desire to prepare themselves for the advanced laboratory courses in general physics which follow. The experiments will be selected to meet the requirements of the individual student.

26. **Photometry and Illumination.** Laboratory work. Repeated in second term, credit one to four hours a term. Prerequisite Physics 14. Assistant Professor RICHTMYER. T Th, 2-5, Rockefeller.

A study of candle power and distribution of intensity of various artificial light sources. Various forms of photometers will be investigated and calibrations made. Tests will be made of the illumination within a room under various conditions of lighting.

27. **Advanced Photometry and Illumination.** Repeated in second term, and throughout the year. Credit, two to six hours a term. Prerequisite Physics 26. Assistant Professor RICHTMYER. Hours to be arranged. Rockefeller.

A continuation of Physics 26 along special lines to meet individual needs, or as a general course preparatory to research. Includes heterochromatic photometry, spectrophotometry, and a critical study of the several fundamental photometric methods and standards of illumination.

28. **Spectrophotometry.** Repeated in second term, credit two to four hours. Prerequisite Physics 14. Assistant Professor RICHTMYER. Hours to be arranged. Rockefeller.

After study of the fundamental principles of photometry, the various spectrophotometric methods will be taken up in such detail as will best suit individual needs. Students who have had course 26 may complete course 28 in two hours.

29. **High Temperature Measurements.** Laboratory and lectures as arranged. Repeated in second term or throughout the year. Credit two hours a term. Prerequisites, Physics 12 or 14. Primarily for juniors and seniors specializing in Physics. Dr. BIDWELL. Rockefeller.

The course includes a study of various types of electric furnaces, the calibration of thermo-junctions and resistance thermometers, optical pyrometry, etc.; also the study of physical properties of materials at high temperatures with original problems.

33. **Alternating Currents.** First term, credit two hours. Prerequisite courses 1, 6 or 10, and 14. Professor BEDELL. T Th, 11, Rockefeller.

A study of the underlying principles of alternating electric currents; the development of graphical methods of analysis as a basis for testing and for the solution of practical problems.

34. **Electrical Laboratory.** Either term or throughout the year, credit as arranged. Prerequisite courses 2, 6 or 10, and 14. Professor BEDELL and Mr. BOWN. Daily 9-1, Rockefeller.

Testing of direct and alternating current apparatus, and the investigation of special problems. Primarily for seniors.

35. **Advanced Electrical Laboratory.** Either term or throughout the year, credit as arranged. Prerequisite courses 2, 6 or 10, and 14. Professor BEDELL and Mr. BOWN. Daily 9-1.

Similar to course 34 but of wider scope. The character of the work will be varied to meet individual needs. Primarily for graduates.

36. **Advanced Alternating Currents.** Throughout the year, credit two hours a term. Prerequisite courses 2, 6 or 10, 14, 33. Professor BEDELL. Hours to be arranged, Rockefeller.

Discussion of the theory and measurement of alternating currents. A seminary for graduates only.

37. **Theses in Applied Electricity.** Second term, or throughout the year, credit two to eight hours a term. Prerequisite courses 2, 6 or 10, and 14. Professor BEDELL. Hours to be arranged, Rockefeller.

40. **Recent Advances in Experimental Physics.** Throughout the year, credit one hour a term. Professor MERRITT. F, 12, Rockefeller B.

Lectures, illustrated by experiments. In 1917-18 a considerable part of the course will be devoted to the subject of conduction in gases.

40a. **Electric Waves and Oscillations.** Second term. Laboratory. Credit one to four hours. Professor MERRITT. Prerequisites ordinarily course 14 and one term of course 40, or their equivalent. Laboratory accommodations limited.

41. **Fluorescence and Phosphorescence.** First term, credit one hour. Prerequisite course 10 or 14. Professor NICHOLS.

42. **History of Physics in the 19th Century.** Second term, credit one hour. Prerequisite course 2. Professor NICHOLS.

• [42a. **History of the Electric Transmission of Intelligence.** Second term, credit one hour. Prerequisite course 2. Professor NICHOLS.] Not given in 1917-18.

[43. **Photometry and the Physics of Illumination.** First term, credit two hours. Prerequisite course 10 or 14. Professor NICHOLS.] Not given in 1917-18.

Lectures on the theory of artificial illumination and on methods of determining the temperature, efficiency, and quality of sources of light.

44. **X-Ray Photography.** Second term, credit two hours. Prerequisite courses 2 and 10, and a knowledge of ordinary photography. Professor SHEARER.

45. **Radioactivity and Allied Phenomena.** Throughout the year, credit three hours a term. Professor SHEARER. Hours to be arranged.

46. **Heat.** Throughout the year, credit four hours a term. Prerequisite courses 2, 7 or 10, and 14. Professor SHEARER. Hours to be arranged, Rockefeller B. Primarily for graduates.

Production of high and low temperatures with methods of measurement; heat transfer; theory of heat and molecular physics; kinetic theory of matter.

47. **Advanced X-Ray Laboratory.** Either term. Hours to be arranged. Professor SHEARER. Open to students who have completed course 44.

[48a. **Electrolysis.** First term, credit one hour. Dr. GERMANN. S, 12, Rockefeller B.] Not given in 1917-18.

48b. **Voltaic Cells and Storage Batteries.** First term, credit one hour. Dr. GERMANN.

49. **Light.** Throughout the year, credit four hours a term. Three periods a week of class-room work based on various texts. One experimental lecture a week by members of the class. Prerequisite courses Physics 21 and Mathematics 7 or their equivalents. Assistant Professor BLAKER. Primarily for graduates. Hours to be arranged.

50. **Physics Seminary.** Throughout the year, credit two hours a term. Professor NICHOLS. Hours to be arranged, Rockefeller B.

50b. **Junior Physics Seminary.** Throughout the year, credit one hour a term. Hours to be arranged. A colloquium conducted by juniors, seniors, and first year graduate students specializing in Physics. Open to others who have the requisite preparation. Assistant Professor RICHTMYER.

51. **Theoretical Physics.** Mechanics and thermodynamics. Throughout the year, credit four hours a term. Professor MERRITT. Primarily for graduates.

[52. **Theoretical Physics.** Electricity and magnetism. Throughout the year, credit four hours a term. Professor MERRITT. Hours to be arranged. Primarily for graduates.] Not given in 1917-18.

54. **Thermodynamics.** Throughout the year, credit two or three hours a term. Prerequisite courses 2, 7 or 10, 14. Physics 20 is advised, though not required, as a preliminary course. Professor TREVOR. Hours to be arranged.

[55. **Kinetic Theory of Matter**, with special reference to gases. Credit two hours a term; probably W F, 11. Dr. KENNARD.] Not given in 1917-18.

[56. **Statistical Mechanics and the Quantum Theory.** Credit two hours a term; probably W F, 11. Dr. KENNARD.] Not given in 1917-18.

57. **Electron Theory.** Lectures and assigned readings. First term, mathematical electron theory, including facts of relativity; second term, applications to conductivity, photo-electricity, thermions, atomic structure. Credit two hours a term; probably W F, 11. Dr. KENNARD.

CHEMISTRY

INTRODUCTORY INORGANIC CHEMISTRY

1. **Introductory Inorganic Chemistry.** Lectures, recitations, and laboratory. Repeated in second term, credit six hours.

1a. Lectures, T Th S, 11, or T Th S, 12, Professor BROWNE and Mr. McCoy. Rockefeller A.

1b. Recitations (one hour a week to be arranged). Laboratory: first term, M F, 2-4.30; T Th, 2-4.30; W, 2-4.30 and S, 8-10.30; second term, M F, 2-4.30; T Th, 2-4.30; W, 2-4.30 and S, 8-10.30; M W, 8-10.30. Dr. WELSH, and Messrs. MCKINNEY, TANNER, FOGLESONG, WIGHTMAN, DANN, STRICKER, and BUTLER.

Entrance credit in chemistry does not carry with it university credit in course 1. If a student entering the University from a preparatory school desires credit in course 1 he must pass an examination set by the Department of Chemistry. This examination is held both in New York City and in Ithaca on the same day in September as the entrance examination. University credit in course 1 that is obtained by passing this examination does not carry with it entrance credit in chemistry.

Examinations for those who were unavoidably absent from the final examination in course 1 will be held at 2 p. m. on the day before instruction begins in the fall.

ANALYTICAL CHEMISTRY

6. **Qualitative and Quantitative Analysis.** Repeated in second term, credit five hours. Prerequisite course 1. Messrs. RIDER, GILCHRIST, LOUDER, STERNHALL, and SUMMERS. Lectures, T Th, 12, Sibley Dome. Laboratory sections, M W F, 2-5; T Th S, 8-11; T Th S, 9-12.

Qualitative work: the properties and reactions of the common elements and acids and their detection in various liquid and solid mixtures.

Quantitative work: the preparation and use of volumetric solutions and work in elementary gravimetric analysis.

Examinations for those who were unavoidably absent from the final examination in course 6 will be held at 2 p. m. on the day before instruction begins in the fall.

7. **Qualitative Analysis.** Repeated in second term, credit six hours. Prerequisite course 1. Messrs. RIDER and GILCHRIST. Lectures: T Th S, 9, Rockefeller B. Laboratory: first term, M W, 2-5, S, 9-12; second term, T Th, 2-5, S, 9-12.

The properties and reactions of the common elements, and of the common inorganic and organic acids, also the qualitative analysis of a number of solutions and solid mixtures.

Students in science are advised and candidates for the degree of Bachelor of Chemistry are required to take this course instead of course 6.

[9. **Advanced Qualitative Analysis.** Repeated in second term, credit one, two, or three hours. Prerequisite courses 7, 12, and 30. Mr. RIDER. Laboratory sections at hours to be arranged.

Essentially a continuation of course 7. A study of the most approved methods for separating and detecting a large number of metals and acids not studied in

course 7, including many of the rare elements. In certain cases a comparative study is made of different methods designed to accomplish a given separation. The qualitative analysis of a number of solutions, solid mixtures, and minerals will be required. For graduates and advanced undergraduates.] Not given in 1917-18.

12. Quantitative Analysis, Elementary Course. Repeated in second term, credit six hours. Prerequisite course 6 (or preferably 7). Assistant Professor LUNDELL and Messrs. KOLLER, MICHENER, and LEVY. Lectures, first term, T Th, 9, Morse 18; second term, T Th, 8, Morse 18.

Laboratory sections: first term, M T W, 1.30-5.30; W Th F, 1.30-5.30; T Th, 10-1; S, 8-1; second term, W Th F, 1.30-5.30, Morse.

The preparation and standardization of various volumetric solutions and their use in analyzing a variety of substances; gravimetric methods.

Students in science are advised and candidates for the degree of Bachelor of Chemistry are required to take this course instead of the quantitative analysis of course 6.

14. Quantitative Analysis, Advanced Course. Repeated in second term, credit two to four hours. Prerequisite course 6 (or 7 and 12). Assistant Professor LUNDELL, and Messrs. KOLLER, MICHENER, JAFFIN, and LEVY.

Laboratory sections: M T, 2-4.30; Th F, 2-4.30; T Th, 10-12.30. Morse.

Gravimetric, volumetric, and electrolytic methods of analysis, and methods of combustion analysis; analysis of iron ores, iron and steel, special alloys, slags, coal and coke, cements and cement materials, alloys, minerals, ores of copper, lead, zinc, mercury, manganese, tin, etc.

15. Quantitative Analysis, Advanced Lectures. Second term, credit two hours. Prerequisite course 6 (or 7 and 12). Assistant Professor LUNDELL. M W, 10, Morse 18. Selected topics in advanced quantitative analysis.

16. Electrochemical Analysis. Repeated in second term, credit one to two hours. Prerequisite course 6 (or 7 and 12). Assistant Professor LUNDELL and Mr. KOLLER.

Laboratory sections: first term, T Th, 2-4.30; second term, T Th, 2-4.30.

A study of the most approved electrochemical methods for the determination of silver, lead, copper, tin, nickel, cobalt, and zinc. Practice will be given in the analysis of alloys and ores.

18. Assaying. First term, credit three hours. Prerequisite course 6 (or 7 and 12), and if possible a course in mineralogy. Assistant Professor LUNDELL and Mr. KOLLER. Lecture F, 10, Morse D. Laboratory, M W, 2-5.

Lectures on the theory and practice of the scorification and crucible assay, and on the metallurgy of copper, lead, zinc, silver, and gold. In the laboratory, practice is given in assay of zinc, lead, copper, gold, and silver ores, mattes, and bullion. Designed for students that are specializing in chemistry and as an elective for students in mechanical and civil engineering.

19. Qualitative and Quantitative Gas Analysis. Lectures. Repeated second term, credit two hours. Prerequisite course 6 (or 7) and Physics 2. Course 19 should be preceded or accompanied by course 12. Assistant Professor ANDERSON. M W, 11, Morse 18.

A discussion of the apparatus and methods employed (a) in the examination of the important industrial gases, (b) in the determination of the heating value of fuels, and (c) in gas evolution experiments. Problems are assigned which afford practice in the calculation and interpretation of results.

20. Technical Gas Analysis. Laboratory. Repeated second term, credit two hours. Open to those who are taking or have taken course 19. Assistant Professor ANDERSON, and Messrs. ERSKINE, CULBERTSON, and HOYT. Laboratory sections: M T, 2-4.30; W Th, 2-4.30; T Th, 10-12.30; S, 8-1. Morse 51.

The analysis of gas mixtures with various forms of apparatus; the complete analysis of flue gas, coal gas, Pintsch gas, Blau gas, natural gas, producer gas, acetylene, and air; the determination of the heating power of gaseous, liquid, and solid fuels; and the analysis of various substances by gas analytical methods

involving the use of the different types of gas evolution apparatus. Within certain limits the work may be selected to suit the requirements of the individual student.

21. Gas Analysis, Advanced Course. Repeated in second term, credit one or more hours. Prerequisite courses 19 and 20. Assistant Professor ANDERSON. Laboratory practice at hours to be arranged. Morse 51.

Special topics in the field of either scientific or industrial gas chemistry, varied to suit the needs of the student.

24. Opticochemical Methods. Second term, credit three hours. Prerequisite course 6 (or 7 and 12) and Physics 2 and 10. Assistant Professor ANDERSON, and Messrs. ERSKINE and JEWETT. Lectures, T Th, 9, Rockefeller 300b. Laboratory sections, M T W Th F, 2-5; T F, 10-1, Rockefeller 330.

The lectures deal with the construction and with the use in chemical analysis of the spectroscope, polariscope, refractometer, colorimeter, spectrophotometer, and nephelometer. The laboratory instruction is devoted to the training of the student in the proper use of these various instruments.

25. Opticochemical Methods, Advanced Course. First term, credit one or more hours. Prerequisite course 24. Assistant Professor ANDERSON. Laboratory practice at hours to be arranged, Rockefeller 330. An extension of course 24. A study of various methods of chemical analysis by optical means, varied to suit the needs of the student.

ORGANIC CHEMISTRY

30. Organic Chemistry. Throughout the year, credit six hours a term. Prerequisite course 6 (or 7 and 12). Open to those who are taking course 12. Professor ORNDORFF, Dr. MAHOOD, and Messrs. ADAMSON, JACKSON, WALDBAUER, and PASKOW. Lectures and written reviews, M W F, 9, Morse 18. Laboratory sections: M T, 1-5.30; W Th, 1-5.30; F, 1-5.30, and S, 8-12.30.

The lectures and written reviews serve as an introduction to the general subject of the chemistry of the compounds of carbon. In the laboratory the student prepares a large number of typical compounds of carbon and familiarizes himself with their properties, reactions, and relations. The detection of inorganic elements in organic compounds and the recognition of various groups or radicals is included in the laboratory work.

31. Organic Chemistry. Throughout the year, credit three hours a term. Prerequisite course 6 (or 7 and 12). Open to those who are taking course 12. Professor ORNDORFF, and Messrs. JACKSON and WALDBAUER. M W F, 9, Morse 18. This course consists of the lectures and written reviews of course 30.

32. Elementary Organic Chemistry. First term, credit four hours. Prerequisite course 6 (or 7 and 12). Open to those who are taking course 12. Dr. MAHOOD and Messrs. ADAMSON, JACKSON, WALDBAUER, and PASKOW. Lectures and oral and written reviews, M W F, 12, Rockefeller B. Laboratory, T or Th, 2-5.

33. Special Chapters in Organic Chemistry. Throughout the year, credit two hours a term. Prerequisite course 30. Professor ORNDORFF and Mr. JACKSON. T Th, 9, first term, W. Sibley 1; second term, Morse 18.

Especial attention is given to certain important chapters of organic chemistry. An attempt is made to acquaint the student with the classical researches in organic chemistry.

34. Advanced Organic Chemistry. Laboratory practice. Throughout the year, credit two to six hours a term. Open to those who have had or are taking course 33. Professor ORNDORFF, Dr. MAHOOD, and Mr. JACKSON. Hours to be arranged. The laboratory is open daily.

The course in the preparation of organic compounds is here continued, the preparations, however, being more difficult and requiring more experience and skill on the part of the student. The original literature is consulted, and, before taking up original work in this field, the student is required to repeat some

extended and important piece of work, and to compare his results with those published.

35. The Coal Tar Dyestuffs. First term, credit one hour. Open to those who have had course 30 and have had or are taking course 33. Professor ORNDORFF. Lectures. Time and place to be arranged.

The methods of making the dyestuffs are discussed, also their properties, constitution, and relations to each other, the treatment being scientific rather than technical.

[36. Stereochemistry. First term, credit one hour. Prerequisite course 30 or 31. Professor ORNDORFF.

The stereochemistry of the compounds of carbon and nitrogen. The necessity of considering the space relations of the atoms in certain classes of physical isomers is shown and the close agreement of the facts and theory is brought out.] Not given in 1917-18.

37. Methods of Organic Analysis. Throughout the year, credit two to six hours a term. Prerequisite course 30. Professor ORNDORFF and Dr. MAHOOD. Hours to be arranged. The laboratory is open daily.

Designed for students who desire practice in the qualitative and quantitative analysis of commercial organic products such as alcohols, ethers, organic acids, glycerin, formalin, acetates, coal tar distillates, petroleum products, soaps, acetanilid, etc.

38. The Coal Tar Dyestuffs. Laboratory practice. Throughout the year, credit two to four hours a term. Open to those who have had or are taking course 33. Professor ORNDORFF and Dr. MAHOOD. Hours to be arranged.

Various intermediate products used in the preparation of dyes are made and from these, representatives of the different groups of dyestuffs are prepared and studied.

INDUSTRIAL CHEMISTRY

[40. General Industrial Chemistry. Throughout the year, credit three hours a term. Prerequisite courses 12, 30, 40, 51. Lectures.

A general discussion of the chemistry of engineering materials, fuel, etc., and of the manufacture and properties of technical chemical products.] Not given in 1917-18.

[41. Advanced Industrial Chemistry. Second term, credit two hours. Prerequisite course 40.

The critical study of important technical chemical processes from the standpoint of theoretical chemistry.] Not given in 1917-18.

42. Chemistry of Illuminating and Power Gases. First term, credit one hour. Prerequisite courses 30, and open to those who have completed or are taking courses 50 and 51. Assistant Professor ANDERSON. F, 11, Morse 18. The chemistry of the manufacture and purification of the important industrial gas mixtures, such as coal, oil, water, carburetted water, and producer gases.

INORGANIC CHEMISTRY

46. Advanced Inorganic Chemistry. Throughout the year, credit two hours a term. Prerequisite course 30, and open to those who have completed or are taking courses 50 and 51. Professors DENNIS and BROWNE, and Mr. BRIDGMAN. Lectures, T Th, 11, Morse 18.

The chemical elements are discussed in the order in which they occur in the Periodic Law of Mendeléeff, and special attention is paid to the group properties of the elements and to the relations of the groups to one another. The rare elements and the rare earths are treated in as great detail as are the more common elements.

47. Advanced Inorganic Chemistry. Laboratory practice. Either term, credit, two, three, or four hours. Prerequisite course 30. Professors DENNIS and BROWNE, and Mr. BRIDGMAN. Morse 16.

The course comprises (a) the study of methods for the preparation and purification of inorganic compounds, including those of the rarer elements; (b) the extraction of radioactive substances and the measurement of radioactivity; (c) the study of the various hydronitrogens and their derivatives in aqueous and non-aqueous solutions; (d) the investigation of two component systems from the point of view of inorganic chemistry. Instruction is given also in the elements of glass-blowing.

Course 47 is designed to accompany course 46, but either course may be taken separately.

[48. **Selected Topics in Advanced Inorganic Chemistry.** Throughout the year, credit two hours a term. Prerequisite course 30. Courses 50 and 51 should precede or accompany this course. First term, Professor BROWNE. Second term, Dr. WELSH.

Experimental lectures, dealing in 1916-17, chiefly with (a) the chemistry of non-aqueous solutions, (b) the application of certain principles of physical chemistry, notably the phase rule, to inorganic chemistry, and (c) certain of the important recent advances in the field of inorganic chemistry.] Not given in 1917-18.

[49. **Chemistry of Gases.** First term, credit one hour. Prerequisite course 6 (or 7 and 12), and should be preceded or accompanied by 19 and 20. Assistant Professor ANDERSON.

The preparation, properties, and reactions of a large number of gases are discussed, and in many cases illustrated by experiments. The various generalizations concerning gases are considered, not only in the light of their scientific value, but also to some extent from the point of view of their application to the practical problems of the gas chemist and of the gas engineer.] Not given in 1917-18.

PHYSICAL CHEMISTRY

50. **Introductory Physical Chemistry.** Throughout the year, credit three hours a term. Prerequisite course 30 or 32, and Physics 2 and 10. Assistant Professor BRIGGS, and Messrs. ENGELDER and BRAY. M W F, 9, Rockefeller B.

A systematic presentation of modern chemical theory. Especial attention is paid to the theory of solution, reactions, reaction velocity, catalysis, chemical equilibrium, and to the application of the principles of physical chemistry to chemical practice.

51. **Physical Chemistry Laboratory.** Throughout the year, credit three hours a term. Open only to those who have taken or are taking course 50. Assistant Professor BRIGGS, and Messrs. ENGELDER and BRAY. Two laboratory periods a week, M T, 2-5; Th F, 2-5; T Th, 10-1. Morse 9.

With the data obtained in the laboratory as a basis, detailed reports covering each subdivision are written. The subject matter includes: the calibration of pipettes, burettes, and measuring flasks; molecular weight determination by vapor density, freezing point, and boiling point methods; vapor pressure; viscosity; colloids; diffusion; absorption; thermo-chemistry; reaction velocity; catalysis; dissociation; solubility; formation, separation, and identification of phases; study of photo-chemical effects.

52. **Advanced Physical Chemistry. Lectures.** Throughout the year, credit three hours a term. Prerequisite course 50. Professor BANCROFT. M W F, 10, first term, Morse 18; second term, Morse D.

An exposition of the law of mass action in its application to chemical equilibrium and reaction velocities.

53. **Applied Colloid Chemistry. Lectures.** Throughout the year, credit two hours a term. Professor BANCROFT. T Th, 10, Morse 18.

The theory of colloid chemistry and its application in the arts. Open to candidates for the degree of Bachelor of Chemistry if they have taken course 50; to others only by special permission.

[55. **Theoretical Electrochemistry. Lectures.** Throughout the year, credit three hours a term. Professor BANCROFT.

The historical development of the subject with special reference to the theory of the voltaic cell. For advanced students in chemistry or physics.] Not given in 1917-18.

56a. Applied Electrochemistry. Lectures. Throughout the year, credit two hours a term. Prerequisite course 50. Assistant Professor BRIGGS and Mr. THOMPSON. M W, 12, Rockefeller B.

The theory of electrolysis and plating; electrolytic extraction and refining of metals; electrolytic manufacture of organic and inorganic compounds; theory and practice of storage cells; preparation of compounds in the electric furnace.

It is advisable, but not obligatory, to take 56b along with this course.

56b. Applied Electrochemistry. Throughout the year, credit two hours a term. Open to those who have had 50 and 51, and have taken or are taking 56a. Assistant Professor BRIGGS and Mr. THOMPSON. Laboratory practice: T, 8-10; W, 8-11; W, 2-5; Th, 8-10. Rockefeller.

Measurements of electrical constants; qualitative study of conditions affecting electrolytic reactions; quantitative relations; determination of current and energy efficiencies in electrolytic and electrothermal work; electrolytic preparation of organic and inorganic compounds; tests of storage batteries; preparation of compounds in the electric furnace; temperature measurements.

57. Advanced Laboratory Practice. Either term or throughout the year. Credit up to six hours a term. Prerequisite courses determined in each case by the professor in charge. Professor BANCROFT, Assistant Professor BRIGGS, and Messrs. ENGELDER, THOMPSON, and BRAY. Hours and work to be arranged. Rockefeller.

Students may elect in mass law, reaction velocity, or efficiency measurements with special reference to course 52; in photochemistry, photography, or colloid chemistry with special reference to course 53; in conductivity or electrometric determinations with special reference to course 55; in electrolytic or electric furnace products with special reference to course 56; in metallography; in the application of physical chemical methods to organic chemistry.

CHEMICAL MICROSCOPY

65. Elementary Chemical Microscopy. Repeated in second term, credit two hours. Prerequisite course 6 (or 7 and 12). Professor CHAMOT and Mr. COLLE. Lecture, F, 12, Morse 18. Laboratory sections: M T, 2-4.30; T Th, 10-12.30; Th, 2-5; F, 10-12. Morse 21.

The use of the microscope and its accessories; microscopic methods as applied to chemical investigations.

66. Advanced Chemical Microscopy. Second term, credit three or more hours. Prerequisite course 65. Professor CHAMOT and Mr. COLLE. Laboratory sections: M W, 9-12.30; W F, 2-5.30. Morse 21.

Practice in the examination and analysis of inorganic substances containing the more common elements with reference to rapid qualitative methods and the analysis of minute amounts of materials.

SANITARY CHEMISTRY

69. Elementary Sanitary Chemistry. Throughout the year, credit five hours a term. Prerequisite course 6 (or 7 and 12) and course 32 (or 30, or 31). Professor CHAMOT, Mr. GEORGIA, and Mr. DIEFENBACH. Lectures, M W, 8, Morse 18. Laboratory practice: M T, 2-5.45; F, 2-5.45 and S, 9-12.45. Recitations to be arranged.

First term: The lectures, recitations, and laboratory practice are planned to serve as an introduction to the methods employed in the examination of water for municipal purposes; the analysis of sewage and garbage; the detection of habit-forming drugs; and the testing of commercial disinfectants.

Second term: The lectures, recitations, and laboratory practice are planned to serve as an introduction to the methods employed in the examination of foods and beverages for adulteration and spoilage.

Either term of this course may be elected independently of the other.

70. Special Topics in Food Examination. First term, credit two hours. Prerequisite second term of course 69. Mr. GEORGIA. Lectures, T Th, 12, Morse 18.

This course is planned to meet the needs of those specializing in sanitary chemistry and will cover in detail some of the special problems of food and beverage analysis, and the manufacture of food products.

[72. Microscopic Examination of Foods. Second term, credit two or more hours. Prerequisite course 65. Professor CHAMOT and Mr. COLB.

The use of the microscope in the examination of foods and condiments for the purpose of detecting deterioration, adulterations, and admixtures.] Not given in 1917-18.

[75. Special Topics in Water Examination. Second term, credit two hours. Prerequisite course 69. Professor CHAMOT.

This course is planned to meet the needs of those specializing in sanitary chemistry and will include a discussion of the natural purification or self-purification of water, modern methods of water filtration and disinfection, the methods employed for the proper control of water purification plants, and the preparation of reports on water examinations.] Not given in 1917-18.

78. Advanced Sanitary Chemistry. Throughout the year, credit two or more hours a term. Prerequisite course 69. Professor CHAMOT and Mr. GEORGIA. Laboratory practice at hours to be arranged.

Students may elect work in any branch of water, food, or beverage analysis or in the fields of water purification or sewage disposal plant control, or in the detection and determination of poisons.

80. Toxicology. Second term, credit two hours. Prerequisite course 30. Professor CHAMOT. Lectures, T Th, 12, Morse 18.

A review of the present methods for the separation and identification of the common poisons together with a brief discussion of the classification, cause of action, and method of elimination of poisonous substances.

AGRICULTURAL CHEMISTRY

85. Agricultural Chemistry. Repeated in second term, credit four hours. Prerequisite course 1. Professor CAVANAUGH. Lectures, T Th S, 11. Place to be announced. Recitations at hours to be arranged.

A general course treating of the relation of chemistry to agriculture and dealing with the composition and chemical properties of plants, soils, fertilizers, feedstuffs, insecticides, and fungicides.

85a. Agricultural Chemistry, Laboratory Course. Repeated in second term, credit two hours. Prerequisite courses 1, 6, 85. Assistant Professor RICE and Mr. FROST. M W, 2-4.30, Caldwell 250. Designed to accompany course 85.

Students electing advanced courses in agricultural chemistry (86-90) are advised to take elementary organic chemistry.

86. Agricultural Chemistry, Advanced Course. First term, credit three hours. Prerequisite course 85a. Professor CROSS. Lectures, M W F, 10, Caldwell 100. The methods of the A. O. A. C. are studied in the analysis of fertilizers, soils, and insecticides.

87. Agricultural Chemistry, Laboratory Course. First term, credit three hours. Assistant Professor RICE. M W, 2-5.45, Caldwell 250. Designed to accompany course 86.

88. Agricultural Chemistry, Laboratory Course. Second term, credit three hours. Assistant Professor RICE. M W, 2-5.45, Caldwell 250. Designed to accompany course 89.

89. Agricultural Chemistry, Advanced Course. Second term, credit three hours. Prerequisite course 85a or 93. Professor CROSS. Lectures, M W F, 10, Caldwell 100. Methods of the A. O. A. C. are studied in the analysis of foods, feedstuffs, sugars, and dairy products.

90. **Advanced Agricultural Analysis.** Repeated in second term. Prerequisite courses 86 and 87 (or 88 and 89). Professor CAVANAUGH or Professor CROSS. Credit and hours to be arranged. Designed to meet the needs of those who wish to do research in agricultural chemistry.

92. **Household Chemistry.** Second term, credit two hours. Prerequisite courses 1, 6, 32. Professor CROSS. Lectures, time and place to be arranged. Designed for students of home economics.

93. **Household Chemistry, Laboratory Course.** Second term, credit two hours. Assistant Professor RICE and Mr. FROST. T Th, 8-10.30, Caldwell 250. Designed to accompany course 92.

SEMINARY

95. **Seminary.** Credit one hour. For seniors who are candidates for the degree B.Chem. Morse 18.

RESEARCH

96. **Research for Undergraduate Students.** Throughout the year.

Seniors who are candidates for the degree B.Chem. are required to elect four hours a term in research under the direction of some member of the staff of instruction.

BOTANY

For a complete course in elementary botany students are advised to take courses 1, 2, and 3. These courses are intended to lay the foundation for advanced work in botany and to prepare students for teaching the elementary principles of the science. Those who wish to begin botany in the second term may begin with course 2, or 3, or both.

1. **General Comparative Morphology of Plants.** First term, credit three hours. Professor ATKINSON and Mr. STORK. Lectures M, 11. Laboratory, T Th, 2-4.30, Sage College, Botanical Lecture Room. If necessary, another section for lectures and for laboratory will be arranged.

A study of the structure, development, and relationships of representative plants among the algae, fungi, liverworts, mosses, ferns, gymnosperms, and angiosperms, with discussions of the general lines of evolution. In the lectures attention will be given to life histories of representative plants in the different groups; also to the form and structure of the reproductive organs, the phenomena of fertilization, the general features of plant anatomy, and the distribution and importance of plant life.

2. **Elementary Plant Physiology.** Second term, credit three hours. Professor ATKINSON and Mr. STORK. Lectures, M or W, 10. Laboratory, W, 11-1; Th, 2-5 (the time may be changed if necessary). Sage College, Botanical Lecture Room.

A study of the fundamental principles of plant activities, the cell, protoplasm, plant nutrition, respiration, irritability, response, and reproduction.

3. **Special Morphology, Taxonomy, and Ecology of the Higher Plants.** Second term, credit three hours. Professor ROWLEE and Mr. DUNLAP. Lectures and recitations, F, 8, and five laboratory hours a week. Sage College, Botanical Lecture Room.

Studies of typical plants representing the more general groups of angiosperms; field excursions for the purpose of studying the local flora. See also course 4.

4. **Geographical Botany.** Second term, credit two hours. Professor ROWLEE and Mr. DUNLAP. Lectures, S, 8. Laboratory exercises and excursions, F, 2-5. Sage College, Botanical Lecture Room.

A study of the vegetation of the earth, supplementary to course 3, which may advantageously accompany this course. Practical field studies in plant distribution; the preparation of an herbarium representing local flora. Photographs are used to illustrate the distribution of plants.

5. Organography and Identification of the Higher Plants. First term, credit three hours. Prerequisite course 3. Professor ROWLEE and Mr. DUNLAP. Lectures, S, 8. Laboratory and field work, F afternoon and S morning. Sage College, Botanical Lecture Room.

A study of the kinds of plants with special reference to the morphology, identification, habitat, and range of species. Extra field work will be substituted for some of the lectures.

7. Taxonomy and Phylogeny of Angiosperms. Second term, credit three hours. Professor ROWLEE.

A study of the genetic relationships of the phanerogamous orders. Practical studies in the laboratory of economic groups, illustrating the principles of natural classification.

8a. Plant Cytology. First term, credit three hours. Prerequisite courses 1 and 2. Professor ROWLEE and Mr. DUNLAP. Lectures, F, 9. Laboratory work, F afternoon and S morning, and by appointment. Sage College, Histological Laboratory.

Introduction to methods of investigation. Studies of the vegetable cell, its multiplication and contents. Practical application of modern methods in a study of nuclear and cell-division.

8b. Comparative Histology of Plants. Second term, credit three hours. Prerequisite course 8a. Professor ROWLEE and Mr. DUNLAP. Lectures, F, 9. Laboratory, F afternoon and S morning, and by appointment. Sage College, Histological Laboratory.

Structure and development of the tissues of higher plants.

[9a. Dendrology. First term, credit four hours. Course 5 may advantageously precede. Professor ROWLEE and Mr. ———. Lectures, T, 10. Laboratory and field work, M afternoon and T morning. Sage College, Histological Laboratory. Open to graduates.

A biological and taxonomic study of trees and shrubs including laboratory study and field observations upon native species]. Not given in 1917-18.

[9b. Xylology. Second term, credit four hours. Courses 8b and 9a may advantageously precede this course. Professor ROWLEE and Mr. ———. Lectures, T, 10. Laboratory and field work, M afternoon and T morning. Sage College, Histological Laboratory. Open to graduates.

Study of the development of woody structures, structure and properties of different kinds of wood, identification of woods, laboratory technique.] Not given in 1917-18.

[10. Comparative Morphology and Embryology. Throughout the year, credit three hours a term. Prerequisite courses 1 and 2 or 3. Professor ATKINSON and Mr. STORK. Lectures, one or two a week by appointment. Laboratory work, one or two periods by appointment. Additional laboratory work, if desired, may be taken under course 13. Those who wish to take the lectures only may register for two hours. Sage College, Botanical Lecture Room and Laboratory. Open to graduates.

A study of representative groups which illustrate the line of evolution of green plants, including the development and homologies of sporogenous, reproductive, and embryological organs, with discussions of the principal plant phyla in the algæ, liverworts, mosses, ferns, gymnosperms, and angiosperms.] Not given in 1917-18.

11. Mycology. Throughout the year, credit four hours a term. Prerequisite courses 1 and either 2 or 3. Professor ATKINSON and Mr. STORK. Lectures, T Th, 11. Laboratory work, M W afternoons or by appointment. Sage College, Botanical Lecture Room and Laboratory. Open to graduates.

Intended as a basis for research in mycology and plant pathology. General classification, development, and plant pathology. Basidiomycetes, with especial attention to edible and poisonous mushrooms, and wood-destroying and parasitic species; the parasitic fungi, their history and development. Practice in the

recognition of species, or research may in some cases be taken along with this course. See course 14a.

[12. **Taxonomy of the Pteridophytes, Bryophytes, and Algæ.** Throughout the year, credit three hours a term. Mr. ———. Open to graduates.

A study of typical genera, practice in taxonomy, and field work.] Not given in 1917-18.

13. **Research in Morphology and Embryology.** Prerequisite course 10, except by special permission. Professor ATKINSON and Mr. STORK. Hours by appointment, Sage College, Botanical Lecture Room. Open to graduates.

Original research in sporogeny or embryology and the morphology of the nucleus with reference to sporogenesis, spermatogenesis, oogenesis, and fertilization, or in experimental morphology. Thesis required.

14a. **General Taxonomic Survey of the Fungi.** First term or throughout the year, credit four hours a term (less with special permission). Prerequisite course 11, except by special permission. Professor ATKINSON and Mr. STORK. Hours by appointment, Sage College, Botanical Laboratory. Open to graduates.

14b. **Research in Morphology of the Fungi.** Throughout the year, credit four hours a term. Professor ATKINSON and Mr. STORK. Hours by appointment. Open to graduates.

Monograph of some genus or limited number of genera, or monographic study of development. A thesis presenting the results of the investigation will be required. Reports weekly.

16. **Research in Taxonomy and Phylogeny of the Angiosperms.** Prerequisite courses 7 and 8, except by special permission. Professor ROWLEE. Hours by appointment. Four or more hours a week. Open to graduates.

A monograph on some group, including a comparative study of organs of taxonomic value and their development. Groups for investigation will be assigned preferably in the preceding spring. Among the groups that may be taken up are the glume bearing monocotyledons, the amentiferous dicotyledons, and the compositæ. Since different groups will be dealt with in different years, students may take this course more than once.

17. **Research in Comparative Histology and Cytology.** Prerequisite courses 8a and 8b. Professor ROWLEE. Open to graduates.

Not less than four hours a week. May form the basis of major or minor work for an advanced degree. Special problems in the comparative histology of a series of organs, or the anatomy of an individual plant. Cytology: the biology and structure of starch, plastids, and other cell contents, also nuclear division and cell formation, with special reference to tissue development.

18. **Seminary in Embryology, Mycology, Physiology, etc.** Credit one hour. Professor ATKINSON. W, 5.

Discussions of current literature and problems under investigation. Required of all graduates and open to undergraduates who are interested in research.

19. **Seminary in Comparative Histology and Taxonomy of the Angiosperms.** Credit one hour. Professor ROWLEE. Hours by appointment.

Reading and discussion of current literature, and problems under investigation in courses 16 and 17, will form the basis for the seminary work. Required of all graduates and open to undergraduates who are engaged in research.

BIOLOGY

1. **General Biology.** Throughout the year, credit three hours a term. Lectures, M W, 9, or T Th, 9, Roberts 131. One practice period a week, T W Th F, or S, 8-10.30, daily, 10.30-1, or daily except S, 2-4.30. Roberts 302 Professors NEEDHAM and JOHANNSEN, and assistants.

This is an elementary course designed to acquaint the general student with the main ideas of biology through selected practical studies of the phenomena on which biological principles are based. Both lectures and laboratory work will

deal with such topics as the interdependence of organisms, the simpler organisms, organization and phylogeny, heredity and variation, natural selection and adaptation, segregation and mutation, the life cycle, metamorphosis and regeneration, and the responsive life of organisms. Laboratory fee, \$2.50 a term.

ENTOMOLOGY, LIMNOLOGY, AND NATURE STUDY

The work of this department is continued during the summer. For the third summer term of sixteen weeks, see the Announcement of the College of Agriculture.

INTRODUCTORY ENTOMOLOGY

2. **The Ecology of Insects.** Third term, credit three hours. One lecture and two practical exercises, largely field work. Lectures, W, 8. Roberts Hall 392. Practical exercises, one W, 10-12.30, and one by appointment. Professor NEEDHAM and Mr. DUSHAM.

A general course in the study of the lives of insects in relation to their environment. Practical studies will be made of the activities of insects and of the rôle that they play in different natural associations. Observations will be made on the relations between their structures and instincts and the situations in which they live, and on many of the ways in which they find a living and establish homes.

3. **General Entomology.** Throughout the year, credit three hours a term. Prerequisite course 1 or Zoology 1. Lectures, W F, 9, Dairy Building 222; Professor HERRICK. Practical exercises, M W Th, or F, 2-4.30, or S, 8-10.30. Roberts 392. Professor HERRICK and Mr. BAERG.

First term, lectures on the characteristics of orders, suborders, and the more important families, and on the habits of representative species. The practical exercises include a study of the structure of insects and practice in their classification. The lectures only (credit two hours) are taken by those who have had courses 4 and 5. The work of the first term may be taken without registration for the second term.

Second term, lectures on the more important insect pests and on methods of controlling them. The practical exercises will include a study of the different stages of as many of the forms as time will permit, together with observations in the field on the habits of the pests. Prerequisite first term of this course. Laboratory fee, \$3.

4. **Elementary Morphology of Insects.** Credit three hours. By appointment. Roberts 391. Professor RILEY, and Messrs. YOUNG, and HESS. An introductory laboratory course. Fee \$2.00.

See note under Course 5.

5. **Elementary Systematic Entomology.** Credit two hours. By appointment. Prerequisite course 4. Roberts 391. Professor RILEY, and Messrs. YOUNG, and HESS.

Laboratory fee, \$2.00.

Courses 4 and 5 are introductory laboratory courses, required of all students who plan to take advanced work in entomology. The work is individual, and both courses may be taken in one term.

SYSTEMATIC ENTOMOLOGY

10. **Entomotaxy.** Third term, credit two or three hours. Prerequisite course 4, should be accompanied by course 5. Laboratory and field work, W F, 2-5, and for three-hour students, Th or F, 10-1. Roberts Hall 301. Assistant Professor VAN DYKE and Mr. ———.

Methods of collecting insects and of preserving them for study and the cabinet, together with other matters of technique. Practice in the identification of the insects of the local fauna. Two all-day field trips will be required.

11. **Advanced Systematic Entomology.** First term, credit three or more hours. Prerequisite course 5. Assistant Professor VAN DYKE and Mr. ———. Three laboratory periods of three hours each during W, Th, F afternoons or S morning. Roberts 301.

A training course in the identification and interpretation of obscure characteristics of insects. One hundred and thirty-five or more hours of work in the laboratory required.

12. Taxonomy of Insects. Throughout the year, credit four hours a term. Prerequisite courses 3, 4, 5, 11, 14, and 20, and preferably 10. Professors NEEDHAM, and JOHANNSEN, Assistant Professors BRADLEY, MATHESON, and VAN DYKE, and cooperating specialists. Lectures, F, 8. Laboratory, F, 10-1, and two other periods of three hours each to be arranged.

This course will continue throughout a number of terms, but the work of each term may be elected independently. The course is intended primarily for graduate students who desire a systematic survey of one or more of the orders of insects.

A. Physopoda, Mallophaga, Heteroptera. First term, 1917-18. Professor JOHANNSEN. **B. Homoptera.** Second term, 1917-18. Professor JOHANNSEN. Special attention will be given to scale-insects and plant-lice. [E. Diptera. Second term, 1918-19. Professor JOHANNSEN.] [G. Hymenoptera. First term, 1918-19. Assistant Professor BRADLEY.] [H. Orthoptera, Euplexoptera, and Thysanura. First term, 1919-20.]

[13. Classification of the Coccidæ. First term, credit two hours. Prerequisite courses 4, 5, and 11. Assistant Professor BRADLEY. Laboratory work by appointment, Roberts 301.

The scale insects are selected as the subject of this course because of their economic importance, but the work of the course is a survey of the whole group without undue emphasis upon the economic forms. Practice is had in the preparation of specimens for study.] Not given in 1917-18.

[14. Entomological Literature and its Technics. First term, credit three hours. Prerequisite course 3 or 5, or Zoology 5. Assistant Professor BRADLEY. Lectures and recitations, M W F, 11, Roberts 392.

A study of general entomological literature. Practice in the use of generic and specific indices, and bibliographies, and in the preparation of the latter. The methods of preparing technical papers for publication. The rules of nomenclature, including the formation of scientific names.

This course is of a technical nature, and is intended to aid students who intend to specialize in entomology or systematic zoology in their contact with literature.] Not given in 1917-18.

15. Advanced Taxonomy of Coleoptera. First term, 1917-18 only, credit three or more hours. Prerequisite courses 11 and 12. Assistant Professor VAN DYKE. Laboratory work by appointment, Roberts 301. Laboratory fee, \$1.50 an hour.

19. Research in Systematic Entomology. Throughout the year, credit three or more hours a term. Prerequisite courses 3, 10, 11, 14, 20, and one term of course 12. Assistant Professors BRADLEY, and VAN DYKE, and Professors NEEDHAM, and JOHANNSEN. Laboratory hours by arrangement, Roberts 301.

INSECT MORPHOLOGY

20. Morphology and Development of Insects. Throughout the year, credit two hours a term. Prerequisite courses 3 (first term), 4, and 5. Laboratory work to accompany or to follow this course is offered under course 21. Professor RILEY. T Th, 10, Roberts 392.

21. Histology of Insects. Repeated in second term, credit three or more hours. A laboratory course to accompany or follow the first term of course 20. Prerequisite courses 3 (first term), 4, 5, and 20. Professor RILEY. Roberts 391.

27. German Entomological Reading. First term, without credit. Professor RILEY. W, 7-9 p. m., Roberts 392.

Open only to advanced students in entomology. Text: Schröder's Handbuch der Entomologie.

28. French Entomological Reading. Second term, without credit. Professor RILEY. T, 7-9 p. m., Roberts 392.

Open only to advanced students in entomology. The work in this course will be based on Henneguy's *Les Insectes*.

29. **Research in Morphology of Insects.** Throughout the year, credit three or more hours a term. Prerequisite courses 3, 4, and 5. Professors RILEY, and NEEDHAM. Laboratory open daily except S, 8-5; S, 8-1. Roberts 391.

Special work arranged with reference to the needs and attainments of each student. Laboratory fee, \$1.50 an hour.

PARASITOLOGY AND MEDICAL ENTOMOLOGY

30. **Animal Parasites and Parasitism.** First term, credit two hours. Must be preceded or accompanied by Zoology 1. Professor RILEY and Mr. CHANDLER. Lectures, T, 8. Practical exercises, sec. 1, M, 2-4.30; sec. 2, T, 2-4.30. Roberts 392.

A consideration of the origin and biological significance of parasitism, and of the structure, life history, and economic relations of representative animal parasites.

31. **The Relations of Insects to Disease.** Second term, credit two hours. Prerequisite course 3 or 30. Professor RILEY and Mr. CHANDLER.

Causation and transmission of disease by insects and other arthropods. Laboratory fee, \$2.

32. **Advanced Work in Parasitology.** Throughout the year, credit two or more hours a term. Prerequisite courses 30 and 31. Professor RILEY and Mr. CHANDLER. Laboratory work and conferences, by appointment, Roberts 391.

Special work adapted to the needs of the individual student. Those planning to work along the lines of the relations of insects to disease, or of parasites of insects, should take course 21 before or along with this course.

LIMNOLOGY

50. **General Limnology.** Second term, credit three hours. Open only to students who have taken or are taking Biology 1. Professor NEEDHAM and Mr. KENNEDY. Lectures, Th, 8, Roberts 392. Laboratory, Th, 2-4.30, and one period by appointment, Roberts 492.

An introduction to the study of the life of inland waters. Aquatic organisms in their qualitative, quantitative, seasonal, and ecological relations. Laboratory fee, \$2.50.

59. **Research in Limnology.** Throughout the year, credit three or more hours a term. Prerequisite course 50 or the equivalent. Professors NEEDHAM and RILEY. Laboratory and field work by appointment. Roberts 492, and Biological Field Station.

NATURE STUDY

60. **Natural History.** Repeated in second term, credit one hour. Professor NEEDHAM, Mr. ALEXANDER, and assistants. Field work only, with morning sections 8-10.30 or 10.30-1 daily, and afternoon sections 2-4.30 daily except S.

This course comprises a series of studies of the sources of our living in nature. Weekly field trips will be made about the University campus and farm and vicinity to seek out the wild relatives of our cultivated crops and domesticated animals, and to study the natural resources of our environment.

Seminary. Throughout the year. M, 4.30-5.30, Roberts 392.

The work of an entomological seminary is conducted by the Jugatae, and entomological club which meets for the discussion of the results of investigations by members.

79. **Journal Club.** Throughout the year. Professors NEEDHAM, RILEY, and HERRICK, and Assistant Professor BRADLEY. Roberts 392.

Reviews and discussions of current literature relating to the work of the department. Required of graduate students.

ZOOLOGY

1. **General Zoology.** First term, credit five hours. Assistant Professor REED, and Messrs. SHADLE, FLAGG, and CARNES. Lectures, M W F, 9, 10, McGraw 5. Laboratory, McGraw 2a: sec. 1, M, 2-4.30, S, 8-10.30; sec. 2, T Th, 8-10.30; sec. 3, T Th, 2-4.30; sec. 4, W F, 2-4.30.

A general survey of the animal phyla, the life processes, adaptations, reaction to environmental stimuli, the relationships of animals, the principles of zoology, and an introduction to morphology and development. As far as possible each phase of the subject is illustrated by living material.

Registration with the department before instruction begins is necessary for the assignment of laboratory and lecture sections. Laboratory fee, \$5.00.

1a. **Elements of Zoology.** Second term, credit three hours. Assistant Professor REED and Mr. SHADLE. Lecture, T, 10, McGraw 5. Laboratory, T Th, 2-4.30, McGraw 2a. For Veterinary students only.

An elementary study of the principles of zoology, the adaptations of animals to mode of life, the classification of the larger and economic groups, and the zoology of the domestic animals. Laboratory fee, \$3.00.

[2. **Morphology of Invertebrates.** Throughout the year, credit three hours a term. M W F, 2-4.30, McGraw 2b. Assistant Professor REED, and Messrs. SHADLE, and GAMBLE. A thorough and detailed study of the morphology and development of invertebrate types based upon laboratory dissections, microscopical studies of parts, and observations upon living animals. Laboratory fee, \$3.50.] Not given in 1917-18.

3. **Comparative Anatomy of Vertebrates.** Throughout the year, credit three hours a term. Assistant Professor REED and Mr. GAMBLE. Laboratory, M W F, 2-4.30, McGraw 5. A thorough dissection and study of a representative of each class of vertebrates. Prerequisite course 1 or 5. Laboratory fee, \$3.50.

4. **Comparative Morphology and Phylogenesis of Vertebrates.** Second term, credit three hours. Assistant Professor REED. Lectures, M W F, 10, McGraw 5.

The various systems of organs are considered with reference to the significance of structure and development in establishing homologies with observations upon the evolution of vertebrate types. Prerequisite, course 1 or 5, embryology (may accompany or precede), and any one of the following: course 3, 12, or medical human anatomy.

5. **Systematic Vertebrate Zoology and Ecology.** Throughout the year, credit three hours a term. Assistant Professor WRIGHT, and ———, ———. Lecture, M, 8, McGraw 5. Laboratory: sec. 1, M W, 2-4.30, McGraw 7; sec. 2, T Th, 2-4.30, McGraw 7.

Lectures on fishes, amphibians, reptiles, birds and mammals, dealing with the principles of classification and nomenclature, the characters and relationships of these groups, their habits, life histories, coloration, respiration, locomotion, reproduction, and adaptations to special ends. Laboratory study of the parts employed in classification, and a practical identification of three hundred and fifty N. A. species. Field work on the various groups is given during each term. The work can be started in either term. A. Fishes, Amphibians, Reptiles. First term. B. Birds and Mammals. Field trips on all five groups. Second term. C. Birds. Second term. Credit two hours.

6. **Field Ornithology.** Second term, credit three hours. Assistant Professor ALLEN and Mr. HUBBARD. Lectures, W, 11, McGraw 5. Field work and laboratory. M W, 2-4.30, or T Th, 2-4.30. Laboratory fee, \$2.

This course is intended primarily for students wishing to gain a knowledge of local birds, their habits, songs, nests and eggs, their relation to agriculture, and the general principles of their conservation. Studies of the ecological groups of birds and of the life-histories of common species will be made emphasizing the adaptations of habit and structure to the environment. Field work will be supplemented by laboratory studies, and after the first of May field trips will be held from 5.30 to 8 a. m. Intended for students not taking course 5.

7. Ichthyology. Advanced Systematic and Field Zoology. Second term, credit three hours. Assistant Professor WRIGHT.

An amplification of the prerequisite, course 5. In the lectures special emphasis will be laid on the principal phases of fish life; the taxonomy, origin, and evolution of fossil and living groups; geographical distribution; and the literature and institutions of zoology. Laboratory periods will be devoted to the identification of exotic and indigenous forms. Field work in the study of our native species.

[8. Herpetology. Second term, credit three hours. Assistant Professor WRIGHT. Lectures, W F, 9, McGraw 5. Laboratory, F, 2-4.30, or S, 8-10.30.

A study of amphibians and reptiles of the world following the method of course 7. Given alternately with course 7.] Not given in 1917-18.

[9. Advanced Ornithology. First term, credit three hours. Prerequisite course 5 or 6. Assistant Professor ALLEN. Lectures, W, 11, McGraw 5. Laboratory and field work, T Th, 2-4.30.

The lectures will consider the structure and classification of birds; the origin and evolution of fossil and living groups; geographical distribution; the literature and institutions of ornithology. Laboratory periods will be devoted to the identification of exotic and indigenous forms. The first part of the term will be devoted to field work on the fall migration, and the identification of birds in winter plumage.] Given alternately with course 11. Not given in 1917-18.

10. Mammalogy. First term, credit three hours. Assistant Professor WRIGHT. A study of mammals following the method of course 7.

11. Economic Ornithology and Mammalogy. First term, credit three hours. Should be preceded by course 6 or Zoology 5; presupposes an elementary knowledge of botany and entomology. Lectures, W, 11, McGraw 5. Laboratory and field work, T Th, 2-4.30. Assistant Professor ALLEN.

This course is designed to assist those planning professional work with birds or mammals. The lectures will take up the various phases of bird and mammal life in relation to agriculture with the methods of increasing beneficial species and destroying vermin; together with the elements of game breeding and fur farming. The laboratory will give practice in the identification of the food of birds, the preparation of material, and the making of skins. The field work will give opportunity for observation of feeding habits, field collecting, methods of attracting birds, and natural history photography.

12. Mammalian Anatomy. Second term, credit three hours. Assistant Professor REED and Mr. GAMBLE. Laboratory, M W F, 2-4.30. A comparative study of mammalian anatomy based upon the dissection of the cat. Laboratory fee, \$3.00.

13. Advanced Work and Research. Throughout the year.

14. Seminary in Systematic Vertebrate Zoology. Throughout the year, credit one hour a term. Zoogeography of the Old World. Assistant Professor WRIGHT. Hours to be arranged.

PHYSIOLOGY AND BIOCHEMISTRY

3. Elementary Human Physiology. Repeated in second term, credit three hours. First term, M W F, 10, Professor SIMPSON and assistants. Second term, section A. M W F, 10, Professor SIMPSON and assistants; section B. M W F, 12, Assistant Professor DRESBACH and assistants. In registering for this course in the second term students are required to specify the section they desire to attend.

An introductory course for students of the biological sciences; also for students who expect to teach physiology in the secondary schools. A general review of the functions of the systems and organs of the human body, with introductory remarks on structure. The lectures will be fully illustrated by experiments, lantern slides, and diagrams.

6. Laboratory Work in Physiology. Repeated in second term, credit two or more hours. Professor SIMPSON, Assistant Professor DRESBACH, and assistants.

Five hours a week, hours and days for first term to be arranged; in second term, any hours T Th, between 10 a. m. and 5.30 p. m.

A beginning course in practical physiology. May be taken after or along with course 3. In the laboratory the student is made to carry out for himself experiments which demonstrate the fundamental facts of the science.

7. **Seminary.** Second term, credit one hour. A seminary in physiology and biochemistry is held at which current literature is discussed, and at which the results of original investigations carried on by workers in the laboratories are presented for criticism. Students are required to attend these meetings and to take part in the discussions, and each student is expected to give a communication on at least one occasion during the term.

8. **Advanced Work and Research in Physiology.** Throughout the year. Professor SIMPSON, Assistant Professor DRESBACH, and assistants. Daily, Stimson Hall, Advanced Laboratory.

In connection with this course a weekly or fortnightly seminary is held.

14. **Elementary Biochemistry.** First term, credit three hours. Prerequisite chemistry 32 or the equivalent. Lectures, M W, 12; conferences, F, 12, Stimson Hall Amphitheatre. Assistant Professor SUMNER and Messrs HILL and BODANSKY.

Designed to impart an elementary knowledge of the substances met with in living, especially animal, tissues, and of the chief facts of digestion, metabolism and nutrition.

(Courses 14 and 14a will not be accepted for the requirements of biochemistry in the medical college.)

14a. **Laboratory Work in Biochemistry.** First term, credit two hours. Open to those who are taking or have taken course 14. Assistant Professor SUMNER and Messrs HILL and BODANSKY. M W, 9-12.

17. **Special Chapters in Biochemistry.** First term, credit one hour. Prerequisite course 14, or chemistry 31, or the equivalent. Assistant Professor SUMNER.

18. **Biochemistry for Medical Students.** Second term, credit two hours. Prerequisite chemistry 32 or its equivalent. F S, 9, Stimson Hall Amphitheatre. Assistant Professor SUMNER and Messrs HILL and BODANSKY.

18a. **Laboratory Work in Biochemistry.** Second term, credit three hours. Prerequisite chemistry 32. F, 10-1, 2-5, and S, 10-1. Assistant Professor SUMNER and Messrs HILL and BODANSKY. Stimson Hall Biochemical Laboratory.

Courses 18 and 18a comprise lectures, and experimental work on fats, carbohydrates, proteins, colloids, digestion, and metabolism. The concluding part of course 18a is devoted to modern methods of quantitative urine analysis.

20. **Advanced and Research Work in Biochemistry.** Throughout the year. Assistant Professor SUMNER. Daily 8-6, Stimson Hall Biochemical Research Laboratory.

ANATOMY

21. **Elementary Human Anatomy.** Second term, credit three hours. Professor KERR and Mr. DAVIS. Lecture demonstrations, M W F, 8, Stimson.

An introductory course for students in the biologic sciences. The structure of the various systems of organs of the human body is demonstrated. The variations and evolution of different organs are explained in the light of their development in the individual and in the race. Previous work in biology (zoology) or physiology is recommended. Not intended for students preparing for medicine.

22. **Anatomical Methods.** First term, credit three hours. Prerequisite Biology 1 or Zoology 1. Previous work in comparative anatomy is also recommended. Professor KERR and instructors. Laboratory F, 2-5, and any morning except Saturday.

23. **Elementary Anatomy for Students of Physical Education.** First term, credit three hours. Professor KERR and Mr. DAVIS. Hours to be arranged.

Bones, joints, muscles. Laboratory study of specimens and special dissections with occasional demonstrations. For those preparing to teach physical training Should be preceded by Biology 1 and preceded or accompanied by Physiology 3 and Anatomy 21.

HISTOLOGY AND EMBRYOLOGY

1. **The Tissues: Histology and Histogenesis.** First term, credit four hours. No prerequisite, but previous work in biology (zoology and botany) or physiology is recommended. Professor KINGSBURY and assistants. Lectures, M W, 11, Stimson. Laboratory, M W, 2-4.30, Stimson.

For students of biology or those preparing for medicine. The cell and cellular origin of the body and the structure and development of its component tissues. Each student will prepare or receive a series of typical microscopic preparations.

2. **The Organs: Histology and Development.** Second term, credit four hours. Prerequisite course 1 or the equivalent. Professor KINGSBURY and assistants. A continuation of course 1. Courses 1 and 2 together give the fundamental facts of the microscopic structure and development of the body.

3. **Special Histology and Technique.** First term, credit two hours. Prerequisite courses 1 and 2, or 1 and 4, or the equivalent. Mr. KINGERY. Two periods, T, p. m., Th, p. m., Stimson.

In this course a more detailed knowledge of histology and greater facility in technique are gained by practical work in one or more of the fields of histology. Designed for those who desire a good working knowledge of histological methods for use in biology and in medicine and who have shown aptitude and ability.

4. **Embryology of Vertebrates.** Second term, credit four hours. Prerequisite course 1 or the equivalent. Lectures or recitations, Professor KINGSBURY. F, 11, W, 8, Stimson Hall. Laboratory, Mr. ———. T, p. m., Th, p. m., Stimson.

For students of biology or zoology, or those preparing for medicine. Preparation and study of embryological specimens from all the chief groups of vertebrates. Particular emphasis is placed on the embryology of the amphibian, chick, and pig. The student also acquires a knowledge of special methods useful in embryological work.

5. **The Nervous System and Organs of Special Sense: Histology and Development.** Second term, credit two hours. Prerequisite course 1 or the equivalent. Laboratory work with demonstrations and quizzes. Professor KINGSBURY and Mr. ———. M, 8-1 and 2-3.

Designed for students who wish a more detailed consideration of the nervous system and organs of special sense than can be given in other more general courses.

7. **Advanced Histology and Embryology.** Throughout the year, credit three or more hours a term. Prerequisite courses 1, 2, 3, or the equivalent. Laboratory work with conferences at hours to be arranged. Professor KINGSBURY and Mr. KINGERY.

Designed for those who are preparing theses or for those who wish to undertake special investigations in histology and embryology.

8. **Seminary.** Throughout the year, credit one hour. Prerequisite courses 1 and 2, or 4; may be taken with course 3 or 7. Hours to be arranged, Stimson.

For discussion of current literature and presentation of original work by members of the department staff and by those doing advanced work in the department.

GEOLOGY

GENERAL GEOLOGY

1. **Elementary Geology.** Repeated in second term, credit three hours. Professor RIES, and Messrs. GREENLAND, BEAN, ELSTON, and ———. Lectures, first term, T Th, 11, Sibley Dome; second term, T Th, 9, Sibley Dome. Laboratory period, M T W Th F afternoon or S morning. Students must register for laboratory assignments at Elementary Geology laboratory, McGraw Hall, before beginning of course. One all-day excursion required.

Planned to give beginners the fundamental principles of this branch of science with special attention to dynamic and structural geology. Those desiring additional work in geology are advised to take one or more of the following courses: 2, 11, 21, 32.

PHYSICAL GEOGRAPHY

2. **Elementary Physical Geography.** Throughout the year, credit three hours a term. Assistant Professor VON ENGELN, and Messrs. ELSTON and ———. Lectures, M W, 9, McGraw, Geological Lecture Room. Laboratory, M or W, 2-4.30, or if necessary, S, 10-1.

By special permission a recitation hour, F, 9, may be substituted for the laboratory period, but students are urged to register for the laboratory and field work in view of the great physiographic interest of the region about Ithaca. All students are required to go on one all day excursion to Taughannock Gorge and Falls.

3. **Geography of North America.** Throughout the year, credit two hours a term. Prerequisite an elementary knowledge of physical geography, preferably course 2. Assistant Professor VON ENGELN. T Th, 10, McGraw, Geological Lecture Room.

A course for the general student emphasizing the influence of the physiographic features of North America upon the history and industrial development of the various sections. Illustrated lectures.

4. **Geography of Europe.** First term, credit two hours. Prerequisite course 2 or the equivalent. Assistant Professor VON ENGELN.

The physiographic development, topographic and climatic features of Europe, and their influence on the history, industry, and commerce of the several nations. Illustrated lectures, textbook, and map study.] Not given in 1917-18.

5. **Glaciers and Glaciation.** Second term, credit three hours. Prerequisite course 2 or, with permission, course 1. Assistant Professor VON ENGELN and Mr. ELSTON. Lectures, M W, 11, McGraw. Laboratory, T, 2-4.30, McGraw.

A study of living glaciers and the phenomena of the glacial period. Field excursions during the laboratory period in the spring; longer excursions on Saturday. Mapping and interpretation of glacial deposits.

6. **Commercial Geography.** First term, credit two hours. Assistant Professor VON ENGELN. Lectures, T Th, 9, McGraw, Geological Lecture Room. Lectures, reading, and reports.

For students desiring to understand the geographic relation of modern history and business. A consideration of the geographic factors affecting the regional distribution, production, and transportation of the more important commodities, with special reference to the rational development of natural resources, particularly of North America. Discussion of river and ocean highways of commerce, of modern city sites, and of the utilization of tropical lands.

8. **Advanced Physiography, Experimental and Research Work.** Throughout the year. For students with requisite preparation. Assistant Professor VON ENGELN and Mr. ELSTON. Hours to be arranged, McGraw. Credit, variable.

Original investigation is undertaken by each student. Reading, conferences, excursions, and presentation of reports of progress to correlate with work. In general, graduate students registering for a minor in physical geography will be expected to take up some problem in this course.

9. **Seminary.** Throughout the year, credit two hours a term. For upper-classmen and graduate students with requisite preparation. Assistant Professor VON ENGELN. M, 4.30, McGraw, Physical Geography Laboratory.

Preparation and reading of reports upon special topics. Abstracts and discussions of current physiographic literature.

Meteorology and Climatology. See Announcement of the College of Agriculture.

MINERALOGY AND PETROGRAPHY

11. Elementary Mineralogy. Repeated in second term, credit three hours; if taken after course 12, credit two hours. Prerequisite Chemistry 1. Professor GILL and Mr. SMITH. Lectures, M W, 8, McGraw, Geological Lecture Room. Laboratory sections to be arranged.

For beginners who desire a general knowledge of the commonest minerals and their uses, the properties by which they are recognized, and their significance as constituents of the earth's crust, or as sources of useful substances.

12. Crystallography. Repeated in second term, credit three hours; if taken after course 11, credit two hours. Prerequisite Chemistry 6 or 7, and Physics 1. Professor GILL and Mr. SMITH. Lectures, T Th, 8, McGraw, Geological Lecture Room. Laboratory hours to be arranged.

The object of this course is to furnish a fundamental knowledge of the characteristics of crystallized matter as a basis for further study of crystalline substances in mineralogy, chemistry, or physics.

13. Mineralogy. Second term, credit three hours; if taken after course 11, credit two hours. Prerequisite course 12. Hours to be arranged. McGraw, Geological Lecture Room. Dr. VANDER MEULEN.

For students wishing to become acquainted with the commoner minerals and with the scientific and practical problems which they suggest.

14. Blowpipe Determination of Minerals. First term, credit one hour. Prerequisite course 11 or 13 and Chemistry 6 or 7. Professor GILL and Mr. SMITH. One laboratory period Saturday morning, McGraw, Mineralogical Laboratory.

15. General Lithology. Second term, credit one hour. Prerequisite courses 1 and 11. Professor GILL. Lectures, recitations, and laboratory practice, F, 8-10, or W, 2-4. McGraw, Mineralogical Laboratory.

An elementary course designed to teach recognition of the various kinds of rocks, their mineral composition, mode of origin, etc.

16. Crystal Measurement and Drawing. Second term, credit two hours. Prerequisite course 12. Professor GILL. Hours to be arranged, McGraw, Mineralogical Laboratory. Laboratory measurement of crystals, with computation and drawing. Course 16 should be taken by students who intend to continue in course 17 or in course 20.

17. Optical Determination of Minerals. First term, credit three hours. Prerequisite courses 12, 13. Professor GILL. M W, and laboratory to be arranged. McGraw, Mineralogical Laboratory.

Especial attention is devoted to the properties of crystals.

18. Petrography. Second term, credit three hours. Prerequisite courses 12, 13, 17. Professor GILL. M W, and laboratory to be arranged. McGraw, Mineralogical Laboratory. Designed to give an elementary knowledge of rocks and their determination under the microscope.

19. Seminary in Mineralogy and Crystallography. Throughout the year, credit one hour a term. Prerequisite courses 12, 13, 17. Professor GILL. Hour to be arranged, McGraw. Devoted to the study of current literature or of some of the more important classics on these subjects.

20. Advanced or Special Work in Mineralogy and Petrography. Throughout the year. Prerequisite courses dependent on nature of work. Professor GILL. Hours to be arranged, McGraw. Adapted to the needs of the individual student.

PALEONTOLOGY AND STRATIGRAPHIC GEOLOGY

21. Historic Geology. Second term, credit three hours. Prerequisite course 1 or its equivalent. A course in invertebrate zoology is also desirable. Professor HARRIS. Lectures, T Th, 11, McGraw, Geological Lecture Room. Laboratory hour to be arranged.

An elementary review of the geologic history of the earth and its inhabitants; the second half of the ordinary course in Elementary Geology. Frequent field

excursions take the place of laboratory work as soon as weather permits. One or two all-day excursions to Rochester Gorge or Union Springs; several half-day excursions by boat on Cayuga Lake.

22. Stratigraphic Geology. Throughout the year, credit three hours a term. Prerequisite courses 1 and 21 or their equivalent. Professor HARRIS. Lectures, M W F, 11, generally, though laboratory and field work will occasionally take the place of lectures. McGraw 28.

First term: Paleozoic of the world. Excursions to Little Falls, Syracuse, Rochester, and Wilkes-Barre. Second term: Mesozoic and Cenozoic of the world. For teachers and students of earth sciences generally.

23. Geologic Mensuration. First term, credit two hours. Prerequisite Geology 1 and 21, or their equivalent, and spherical trigonometry. Professor HARRIS and Mr. OLSSON. Lectures to be arranged, McGraw 28. Lectures or field periods, three weekly.

Designed to give the field geologist a knowledge of such instruments, methods, and special mathematics as he will need in his professional work.

24. Invertebrate Paleontology. Credit two hours each term. Prerequisite a three hour course in biology. Professor HARRIS and Mr. OLSSON. M W, 9, (or hours to suit the convenience of all), McGraw 28. Laboratory to be arranged.

Taking up foraminifera, graptolites, crinoids, brachiopods, mollusks, trilobites, limuloids, etc., i. e. those forms but poorly represented in present faunas, yet of paramount importance in zoological and paleontological advanced work.

25. Paleontology and Stratigraphic Geology and Research. Course 1 and Biology 1 or their equivalent must be taken before or with this work. Professor HARRIS and Mr. OLSSON. Hours to be arranged, McGraw 28.

Advanced stratigraphic and paleontologic research, progress of research, and current literature.

ECONOMIC GEOLOGY

30. Building Stones and Clay Products. First term, credit two hours. Professor RIES, and Messrs. BEAN, and ———. Lectures, T, 9. Laboratory, W or F, 2, McGraw.

The occurrence, distribution, and uses of building stones, and the applications of clay for structural products.

31. Engineering Geology. Throughout the year, credit three hours a term. Required of civil engineering students. Open to others only by special permission. Professor RIES, Assistant Professor SOMERS, and Mr. TEAS. Lectures, M W, 11. Laboratory, M T W Th F, 2, or S, 8, McGraw.

Discusses the practical application of geologic principles and the occurrence of such economic materials as are of importance to engineering students.

32. General Economic Geology. Throughout the year, credit three hours a term. For first term, prerequisite course 1 or equivalent; second term, prerequisite courses 1 and 11, or their equivalent. Professor RIES and Assistant Professor SOMERS. Lectures, M W, 10. Laboratory, Th, 2, McGraw.

The origin, nature, distribution, and uses of the non-metallic and metallic products of the earth's crust. First term, the non-metallics, including coal, oil, gas, clays, salt, fertilizers, etc. Second term, the metallic products, including the ores of iron, copper, lead, zinc, gold, silver, etc. Students may take lectures without laboratory only by special permission. Field trips may be substituted for a portion of the laboratory work.

33. Geologic Examination of Mineral Deposits. Second term, credit two hours. Prerequisite course 31 or 32. Assistant Professor SOMERS. T Th, 11, McGraw.

Designed to acquaint the student with the methods used for examining deposits of economic value, with a view to determining their extent and character.

34. Mining of Mineral Deposits. Two or three hours a term as the student desires to elect. Assistant Professor SOMERS. Lectures, M W F, 9, McGraw.

A general course describing the methods of mining deposits of economically valuable materials, and the relation between the origin and structure of the deposits and the methods used.

35. **Clay Investigation.** Prerequisite courses Geology 1 or 31 and Chemistry 1 or its equivalent. Professor RIES. Hours to be arranged, McGraw. Lectures and laboratory work. Designed to familiarize the student with the character, occurrence, and technology of clays.

36. **Advanced or Special Work in Economic Geology.** Throughout the year. Prerequisite courses dependent on the nature of the work. Professor RIES and Assistant Professor SOMERS. Hours to be arranged, McGraw.

The course varies with the needs of the individual student, and may consist of lectures or laboratory work, or both.

37. **Economic Geology Seminary.** Throughout the year. Professor RIES. Hours to be arranged. Abstracts and discussions of current literature, and preparation of papers on special subjects. Prerequisite course 32.

39. **Field Work in Mining Geology.** Credit three hours. Professor RIES and Assistant Professor SOMERS. Required of students of mining engineering.

In the summer following the junior year, students taking the courses in mining are required to devote about 8 weeks to field work in a mining district and submit a written report in standard form of the work done and observations made.

MILITARY SCIENCE AND TACTICS

1. **Practical and Theoretical Military Training.** Throughout the year. Every male student, a candidate for a baccalaureate degree, who is required to take five, six, seven, eight or more terms in residence, must take, in addition to the scholastic requirements for the degree, one, two, three, or four terms respectively in the Department of Military Science and Tactics. Hours to be arranged, Drill Hall.

The requirements in Military Science and Tactics must be completed in the first terms of residence; otherwise the student will not be permitted to register again in the University without the consent of the University Faculty.

The course of training is that prescribed by the War Department as basic for units of the Reserve Officers Training Corps, and includes physical drill, infantry drill, rifle shooting, personal hygiene, first-aid, camp sanitation, signaling, bayonet combat, map reading, military history, construction of intrenchments and obstacles, and the fundamental principles of infantry tactics.

2. **Elective Military Training.** Throughout the year, credit two hours a term. Hours by assignment. Drill Hall.

This is the advanced course prescribed by the War Department for units of the Reserve Officers Training Corps, and includes three hours each week in the performance of the duty of officer or non-commissioned officer with organizations undergoing the training given under course 1, and two hours each week of theoretical instruction in preparation for such duties. Prerequisite course 1, or its equivalent.

Course 2 may be elected only by permission of the Dean of the College of Arts and Sciences, and the Professor of Military Science and Tactics. To enjoy the benefits offered by the Federal Government the student must agree to continue the course for four terms, and to attend two summer camps having a duration of one month each.

PHYSICAL EDUCATION

The following courses are offered in view of the constantly growing demand for teachers in Physical Education, with university training, as well as for teachers in other branches who can exercise intelligent supervision over the physical activities, which are rapidly becoming an integral part of school and college curricula. In preparation for the courses described below, students should take in the first two years Chemistry 1, Physics 2, Biology 1 or Botany, Zoology 1 or 5,

Physiology 3, and Anatomy 21. Students intending to follow Physical Education as a profession or who wish to meet the New York State requirements for teachers in physical training, by taking a special two years' course, should consult the department.

10. **Principles of Physical Education.** For juniors. Throughout the year, credit three hours a term. Lectures, M W, 9, Goldwin Smith. Three hours of practice at hours to be arranged. Professor YOUNG, Dr. ———, Dr. MATZKE, and Miss ATKINSON.

The lectures will include the physiology of exercise, kinesiology and the prescription of exercise (application to defects of posture and development, nutrition, circulation and nervous system), anthropometry, and first aid to the injured. Practice work will consist of lower grade methods (gymnastic stories, rhythm, singing games, marching and free hand work) and assigned work in the gymnasium and on the athletic field.

11. **Hygiene, Personal and Public.** Repeated in second term, credit two hours. T Th, 12, Goldwin Smith, Professor YOUNG, Dr. ———, Dr. MATZKE.

The topics to be considered will include the care of the body, clothing, bathing, sleep, exercise, diet, prevention of diseases, etc.; also community problems such as infectious diseases, vaccination, heredity, eugenics, methods of disinfection, milk, and other foods, and garbage disposal.

12. **Physical Diagnosis.** For juniors and seniors. Second term, credit two hours. W F, 12, Goldwin Smith. Dr. ——— and Dr. MATZKE.

The appearances, conditions, defects, and deformities likely to be met in the examining room.

13. **Principles of Physical Education.** For seniors. Throughout the year, credit three hours a term. Lectures, T Th, 9, Goldwin Smith. Professor YOUNG and Miss ATKINSON.

The lectures will include the history of physical training, (Grecian, Roman, Swedish, German, French, English, and American systems), theory of play, place and influence of athletics, playground and school gymnastics, organization and administration of recreative centers. The practice work will consist of upper grade and high school methods (marching and tactics, heavy and light apparatus, folk and æsthetic dancing, and games) and assigned work in the gymnasium and on the athletic field. A considerable amount of time during this year will be devoted to practice teaching.

PHYSICAL TRAINING FOR MEN

1. **For Freshmen Excused from Drill.** Throughout the year, three periods a week. Class and squad work and prescribed exercises. Mr. SPORE and assistants.

2. **For Sophomores Excused from Drill.** Throughout the year, three periods a week. Class and squad work and prescribed exercises. Mr. SPORE and assistants.

PHYSICAL TRAINING FOR WOMEN

4. **For Freshmen.** Throughout the year, three periods a week. Miss CANFIELD and Miss FURCHGOTT.

5. **For Sophomores.** Throughout the year, three periods a week. Miss ATKINSON and Miss FURCHGOTT.

The work of the two years consists of outdoor games and exercises from the beginning of the year to Thanksgiving, and from the Easter vacation to the end of the year. From Thanksgiving to Easter the work is in large part indoors, and consists of floor exercises, folk and æsthetic dancing, and indoor games, in all of which certain prescribed tests must be met at the end of each period. At the beginning of the college year, six lectures on "Health and Hygiene" are given, attendance upon which is compulsory for all first year students. For further information as to the required work in physical training, see the handbook issued by the Department.

